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Yum et al.

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(54) **MOBILE TERMINAL, OPERATING METHOD THEREOF, AND REFRIGERATOR**

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This patent is subject to a terminal disclaimer.

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G05B 15/02 (2006.01)

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(52) **U.S. Cl.**

CPC **F25D 23/00** (2013.01); **F25D 29/00** (2013.01); **F25D 2400/361** (2013.01); **F25D**

2500/06 (2013.01); **F25D 2700/08** (2013.01); **G05B 15/02** (2013.01); **G06Q 10/087** (2013.01)

(58) **Field of Classification Search**

CPC **F25D 23/00**; **G05B 15/02**

USPC **340/3.1, 3.7, 3.71, 12.22, 12.25; 62/125**

See application file for complete search history.

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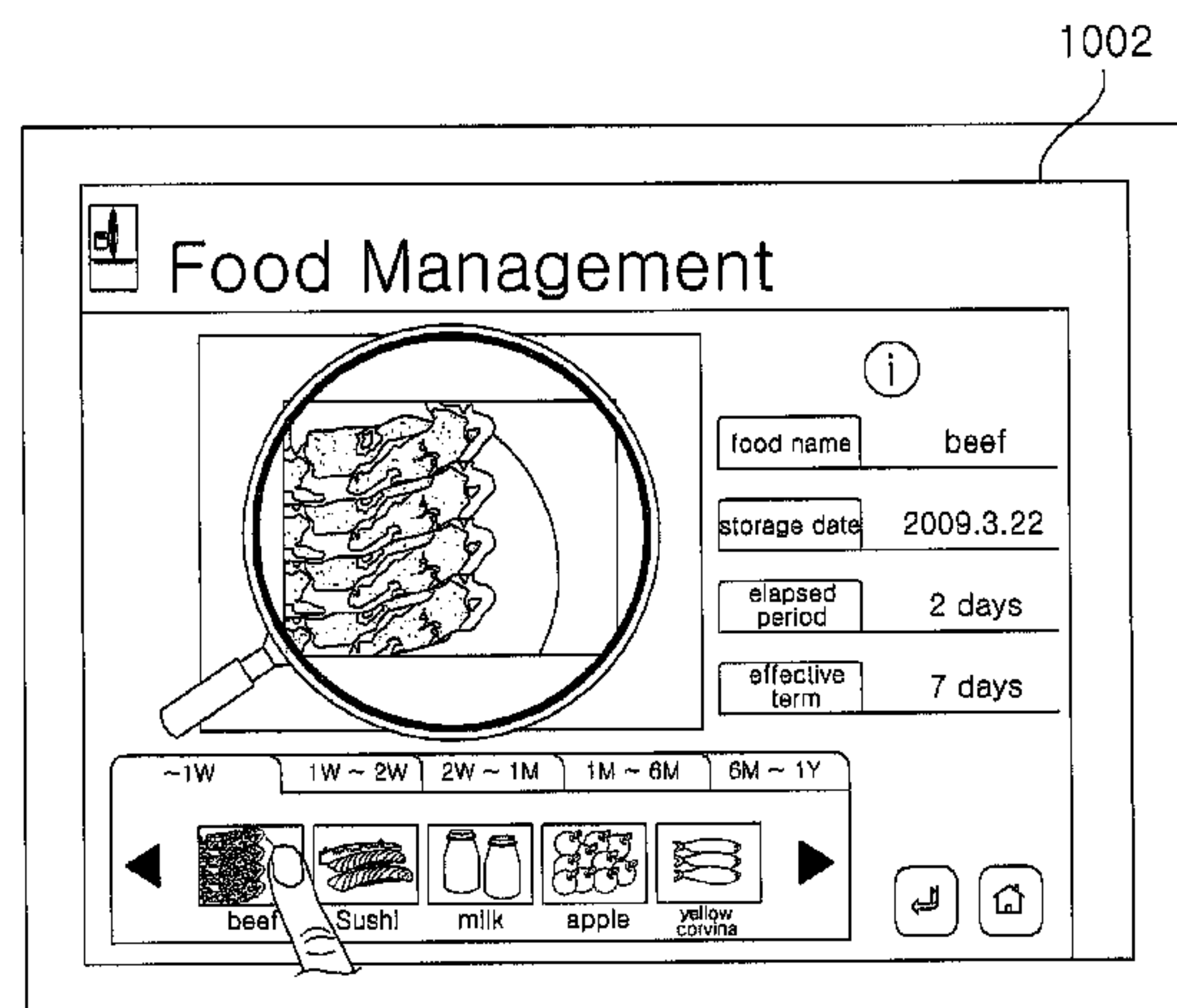
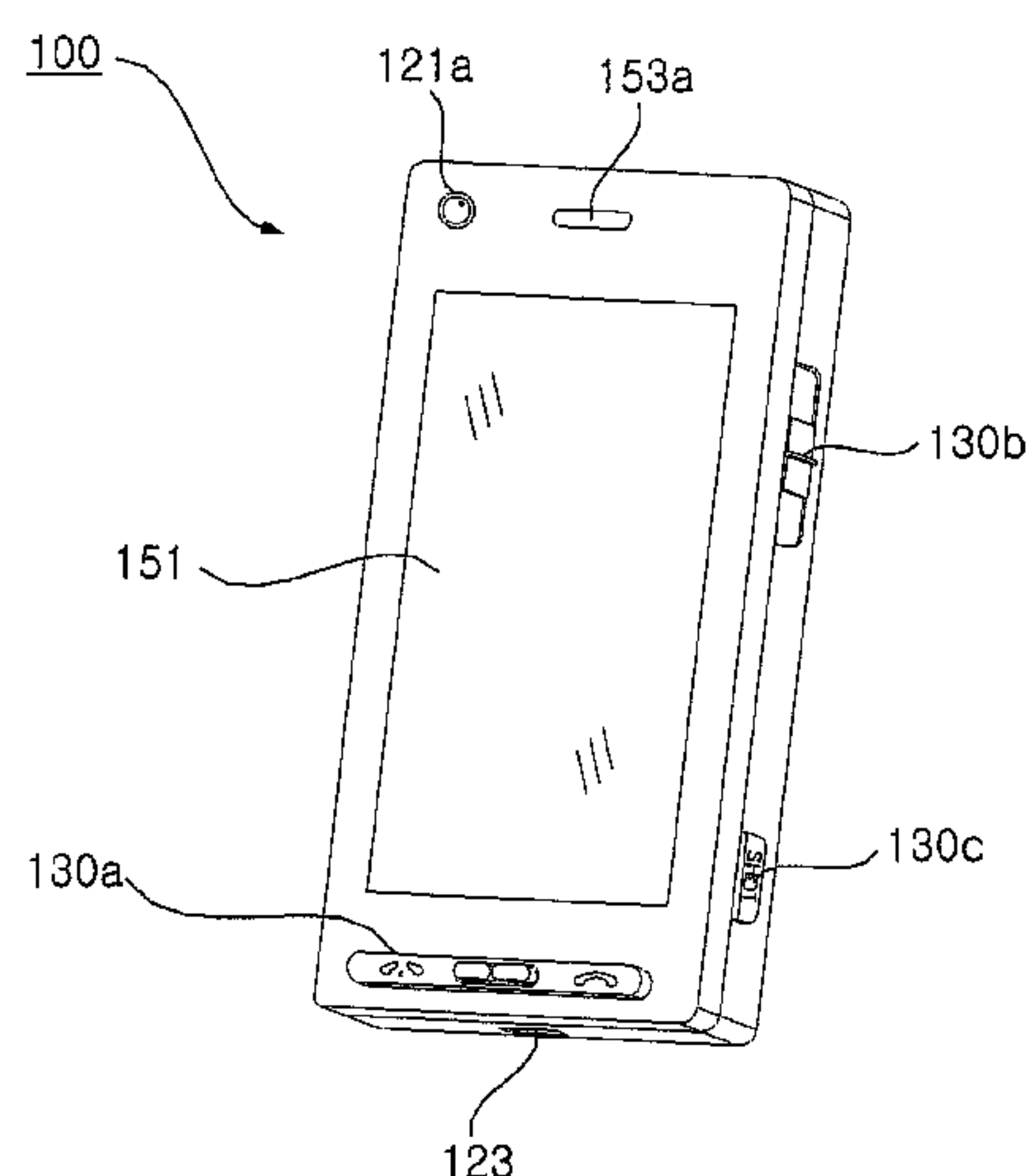
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(57) **ABSTRACT**

A mobile terminal, an operating method thereof, and a refrigerator are disclosed. The operating method of the mobile terminal includes receiving state information of the refrigerator from the refrigerator, displaying the state information of the refrigerator on a screen, and transmitting a control signal based on a control operation to the refrigerator. Therefore, it is possible to readily control the refrigerator using the mobile terminal.

10 Claims, 24 Drawing Sheets



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FIG. 1

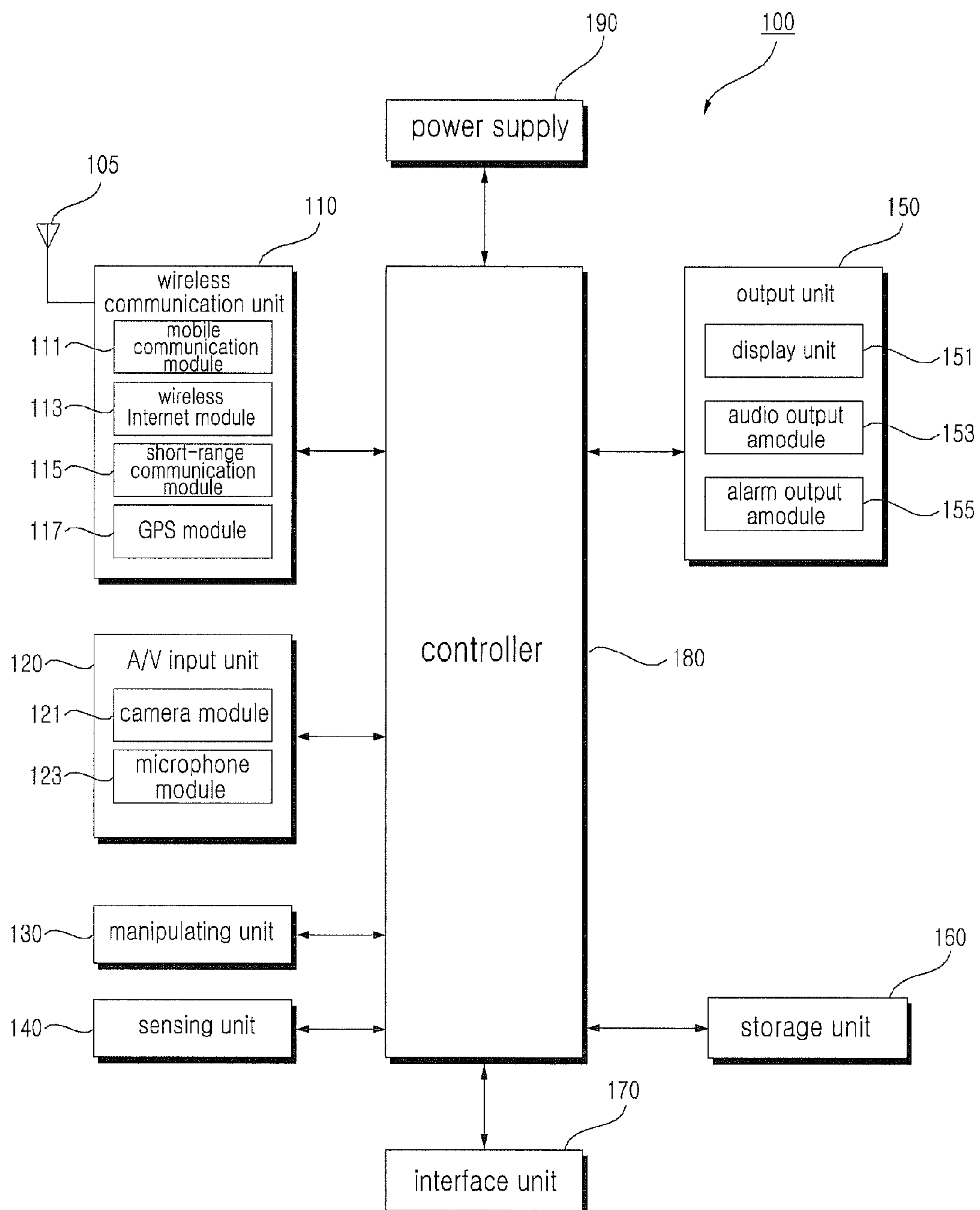


FIG. 2

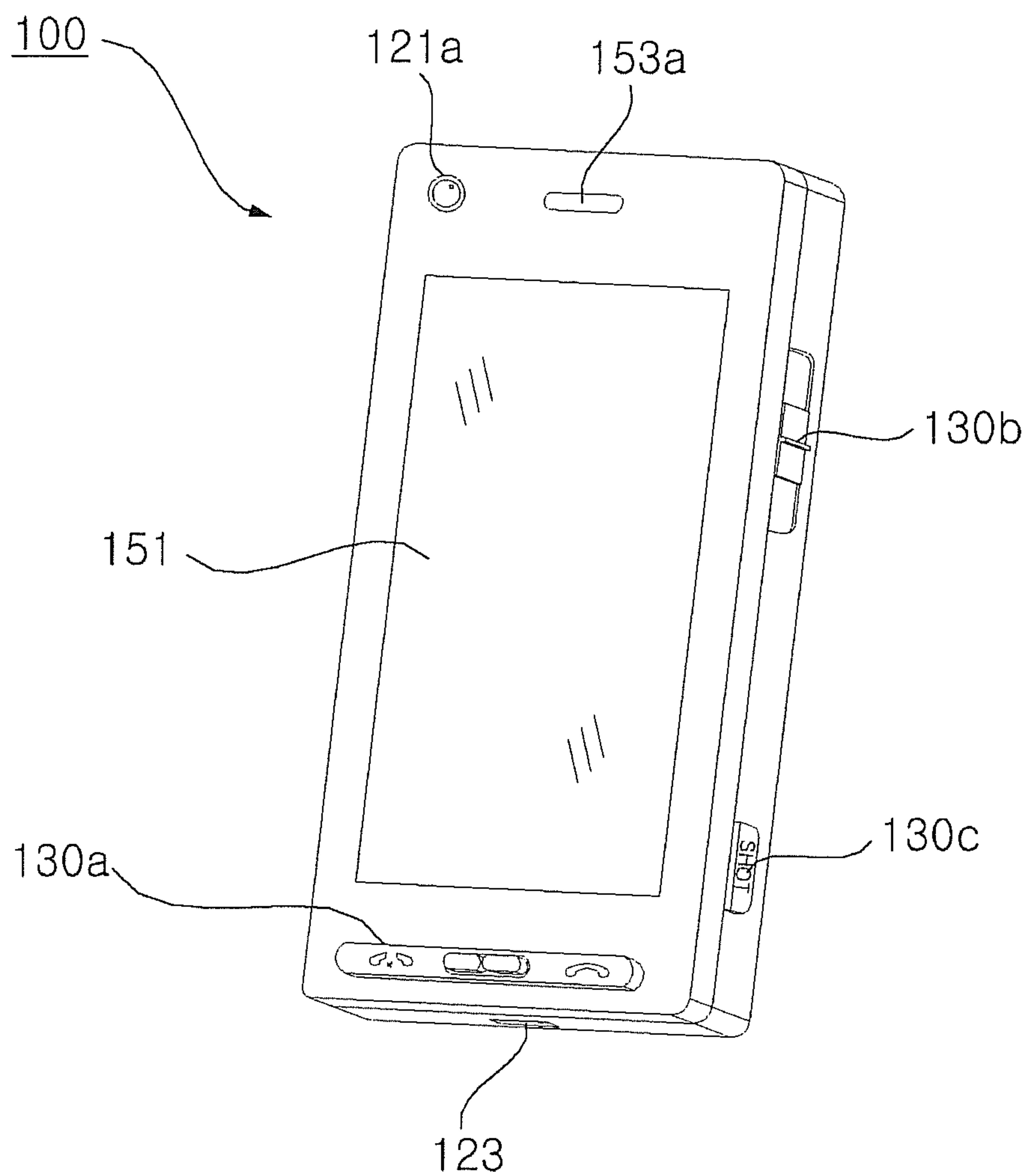


FIG. 3

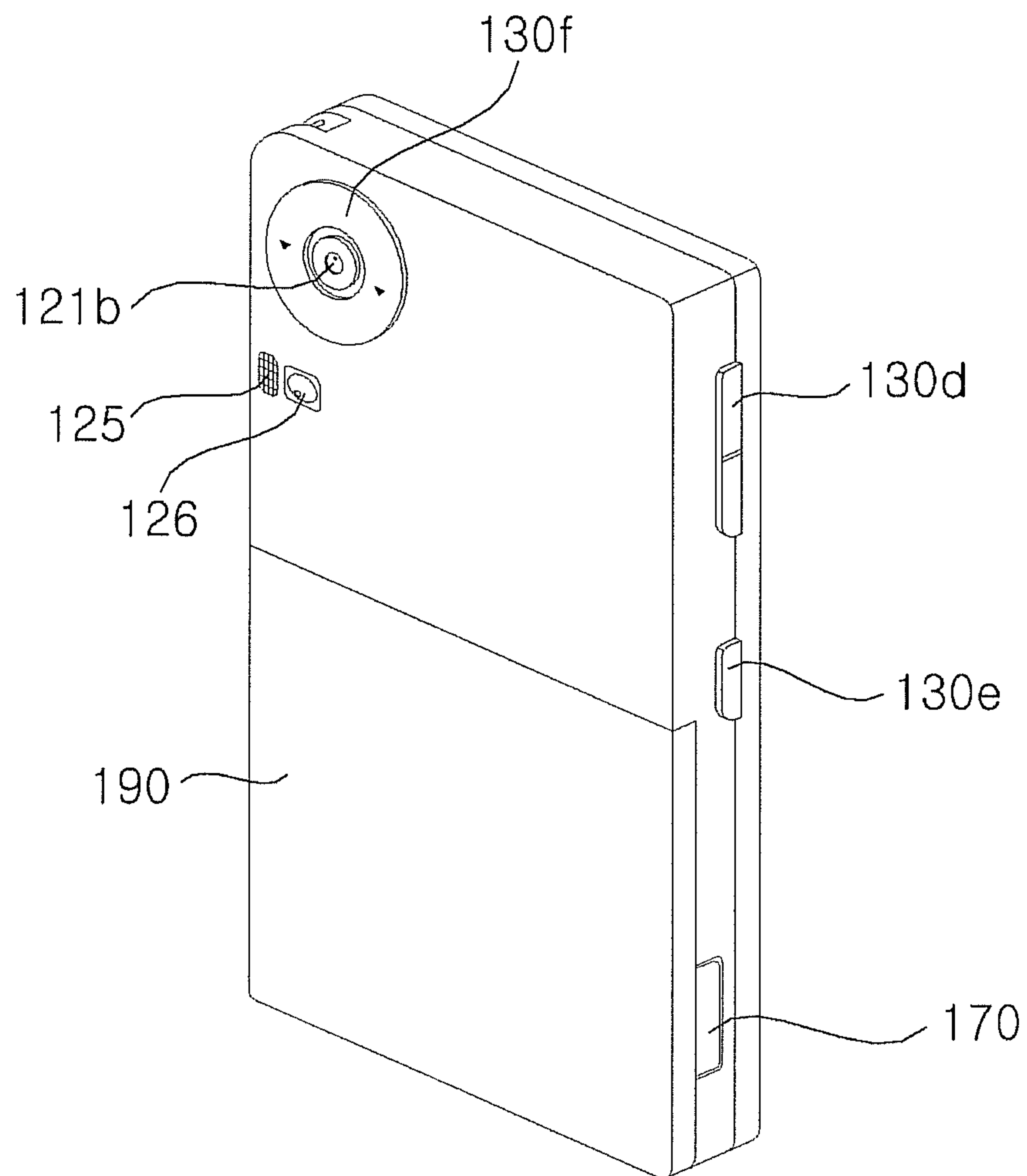


FIG. 4

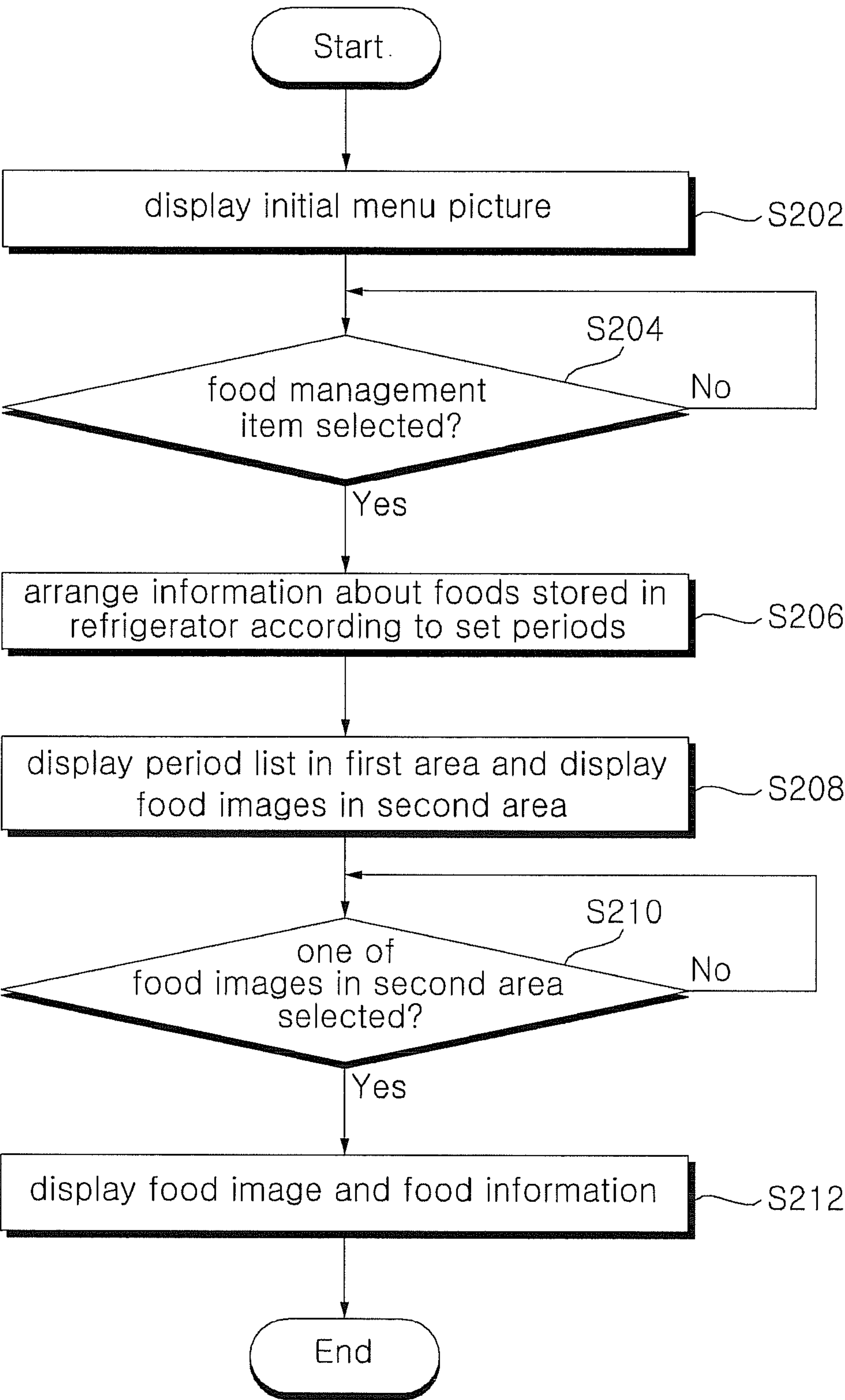


FIG. 5

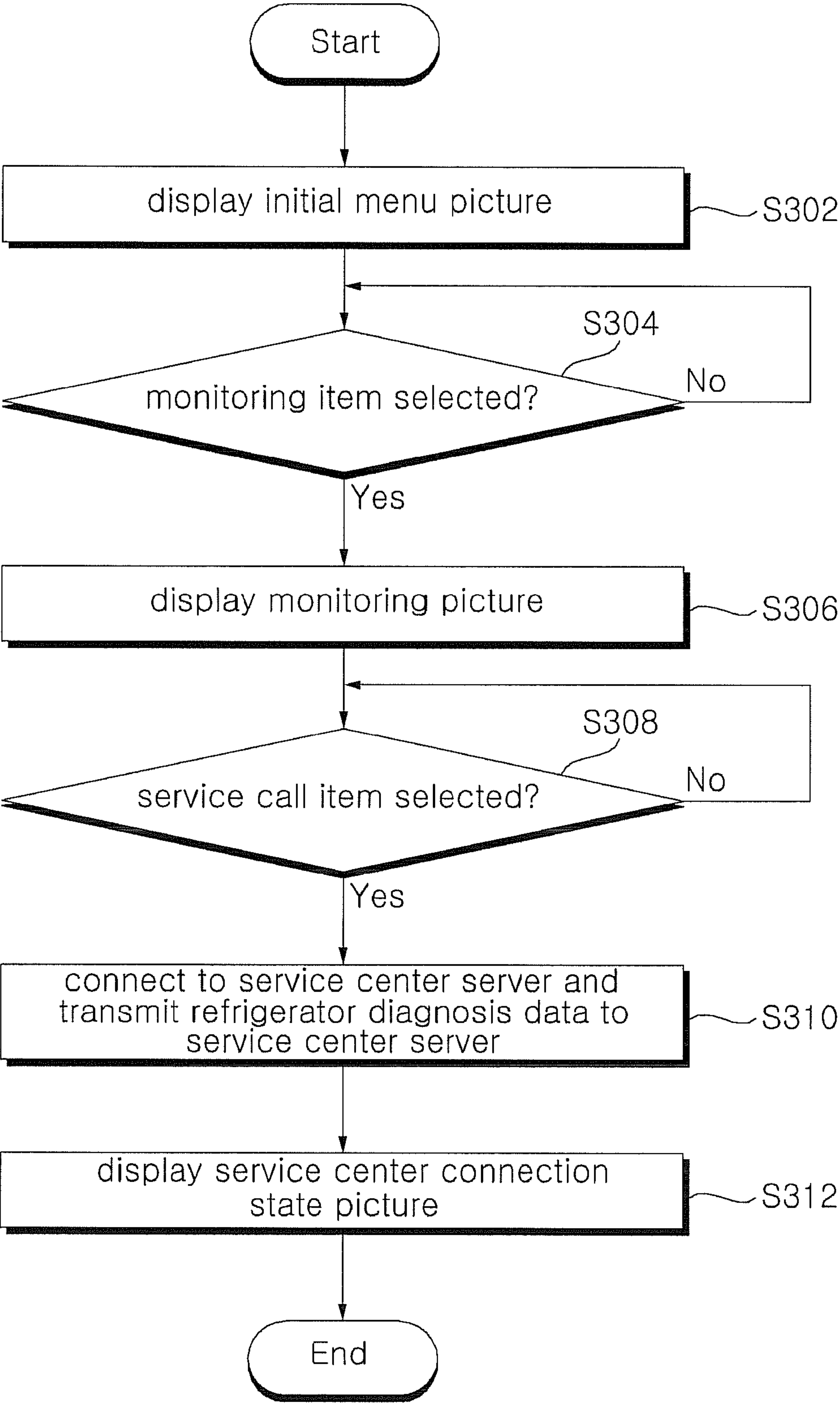


FIG. 6

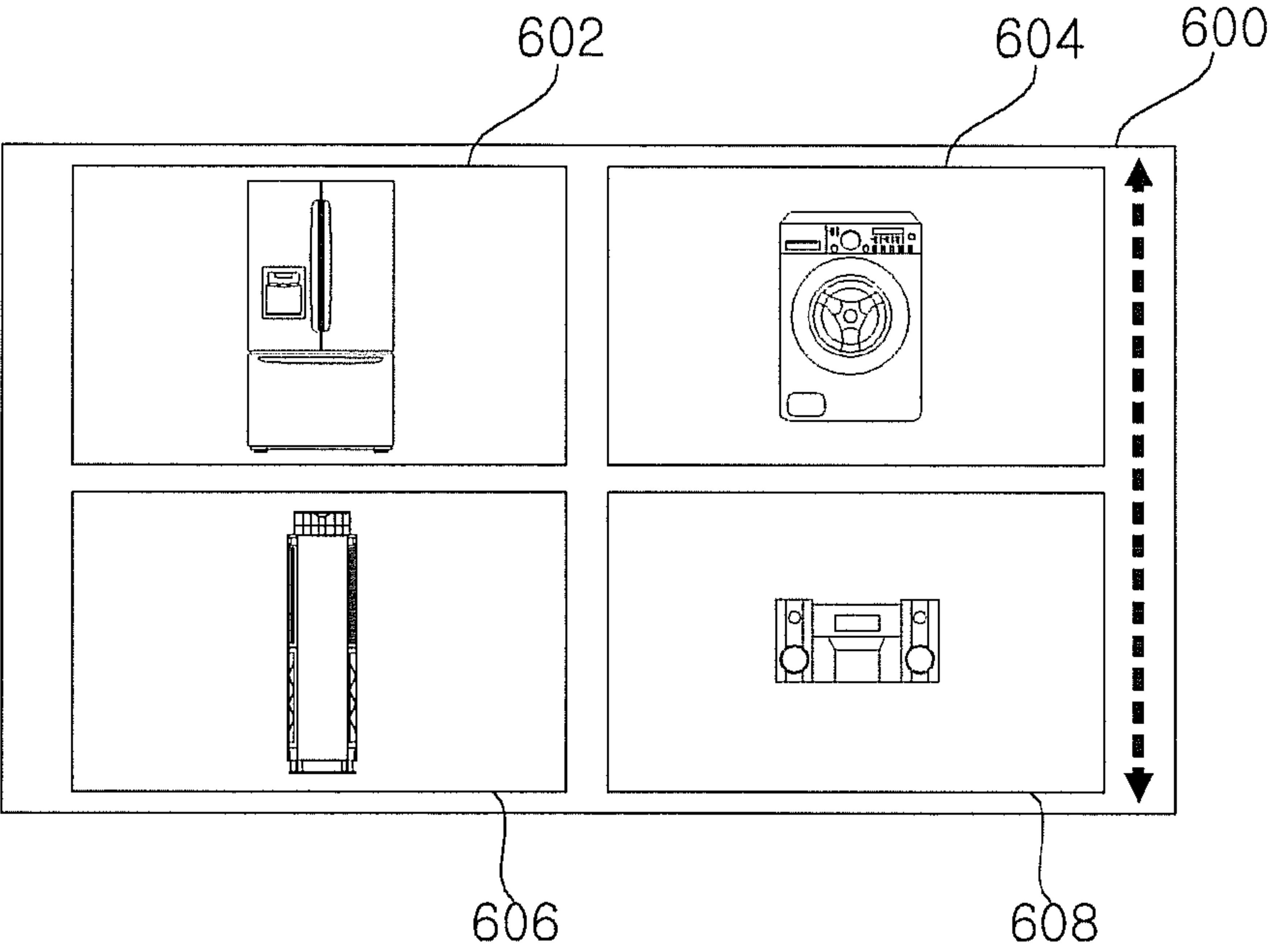


FIG. 7

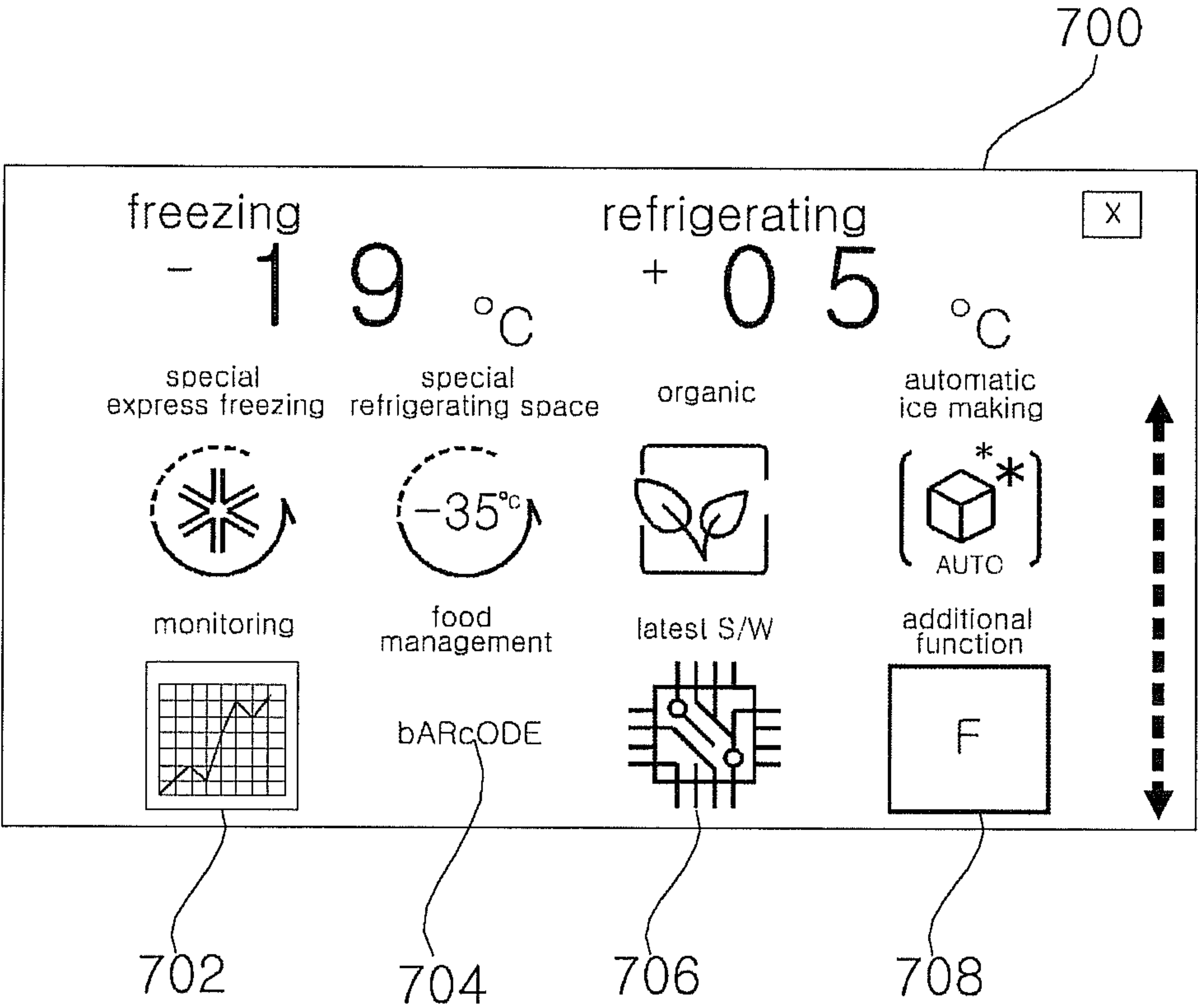


FIG. 8

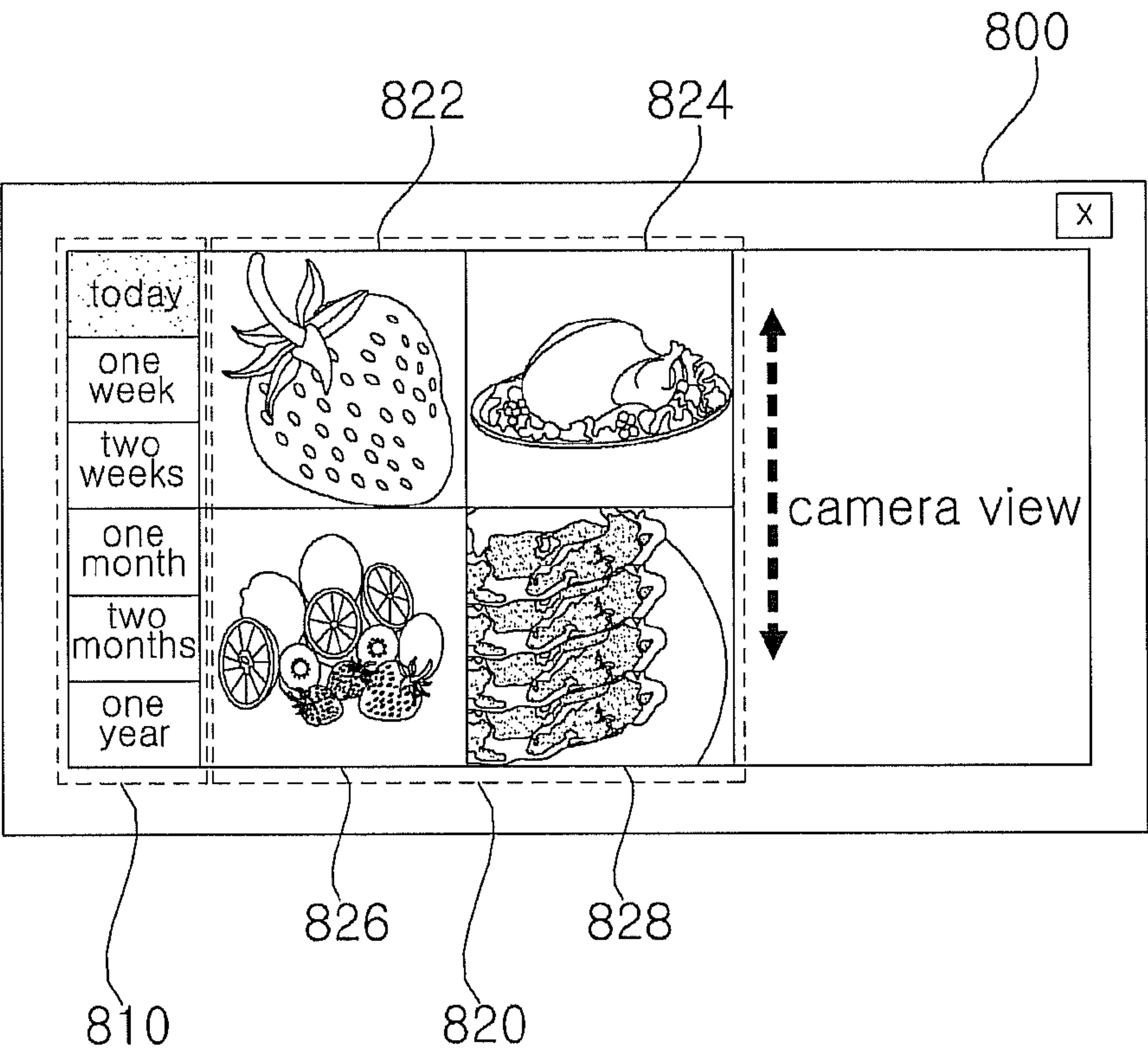


FIG. 9

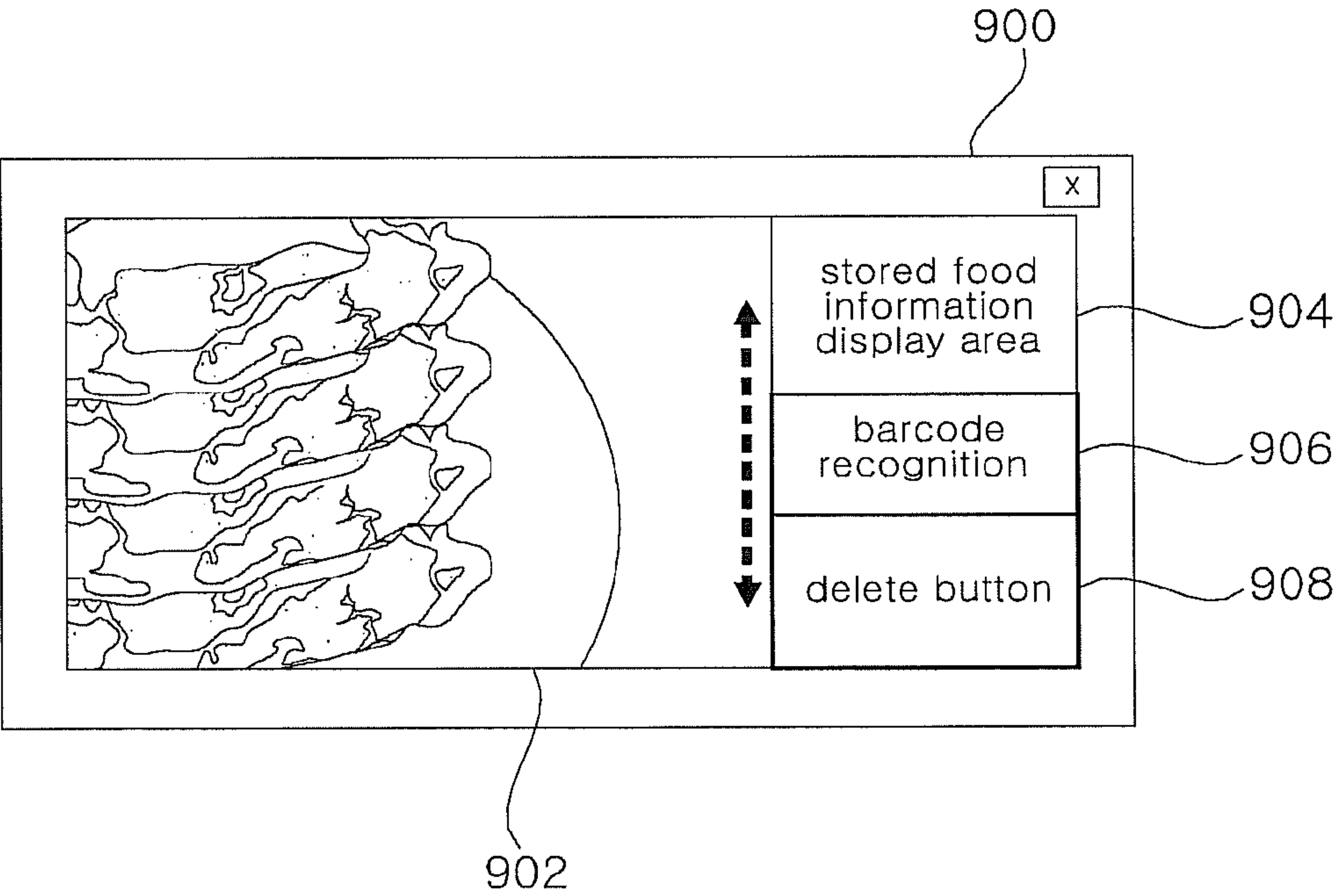


FIG. 10A

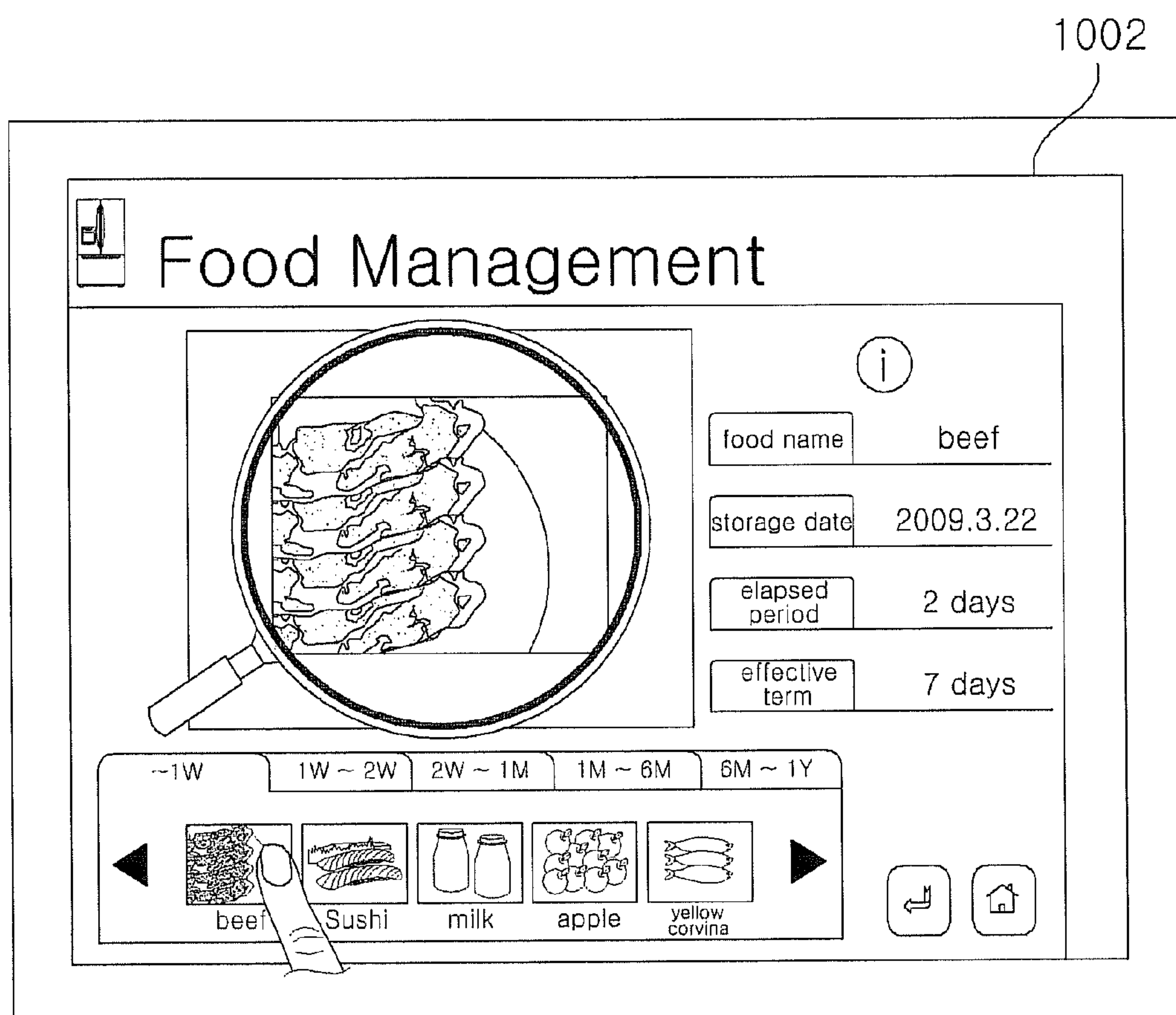


FIG. 10B

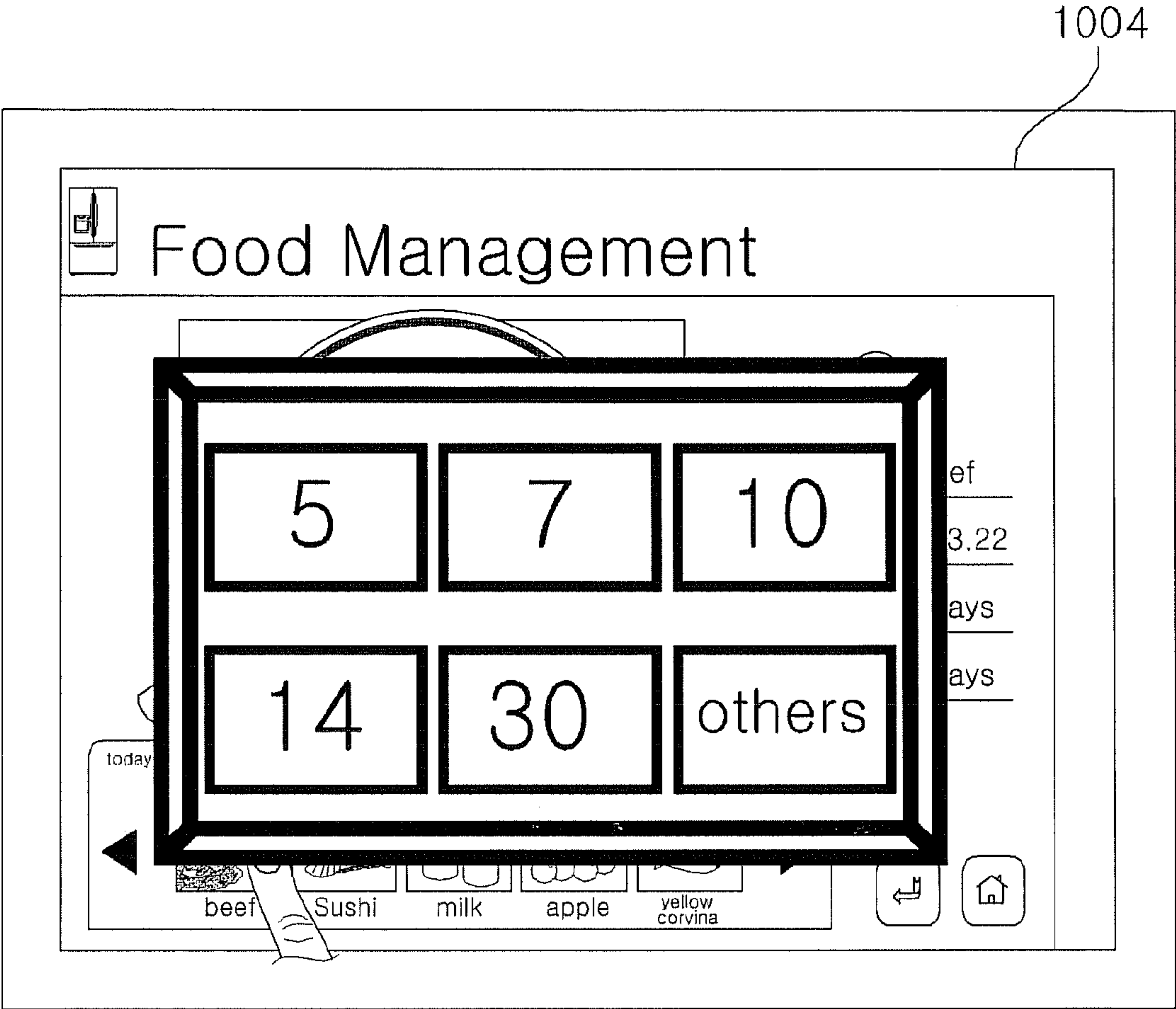


FIG. 10C

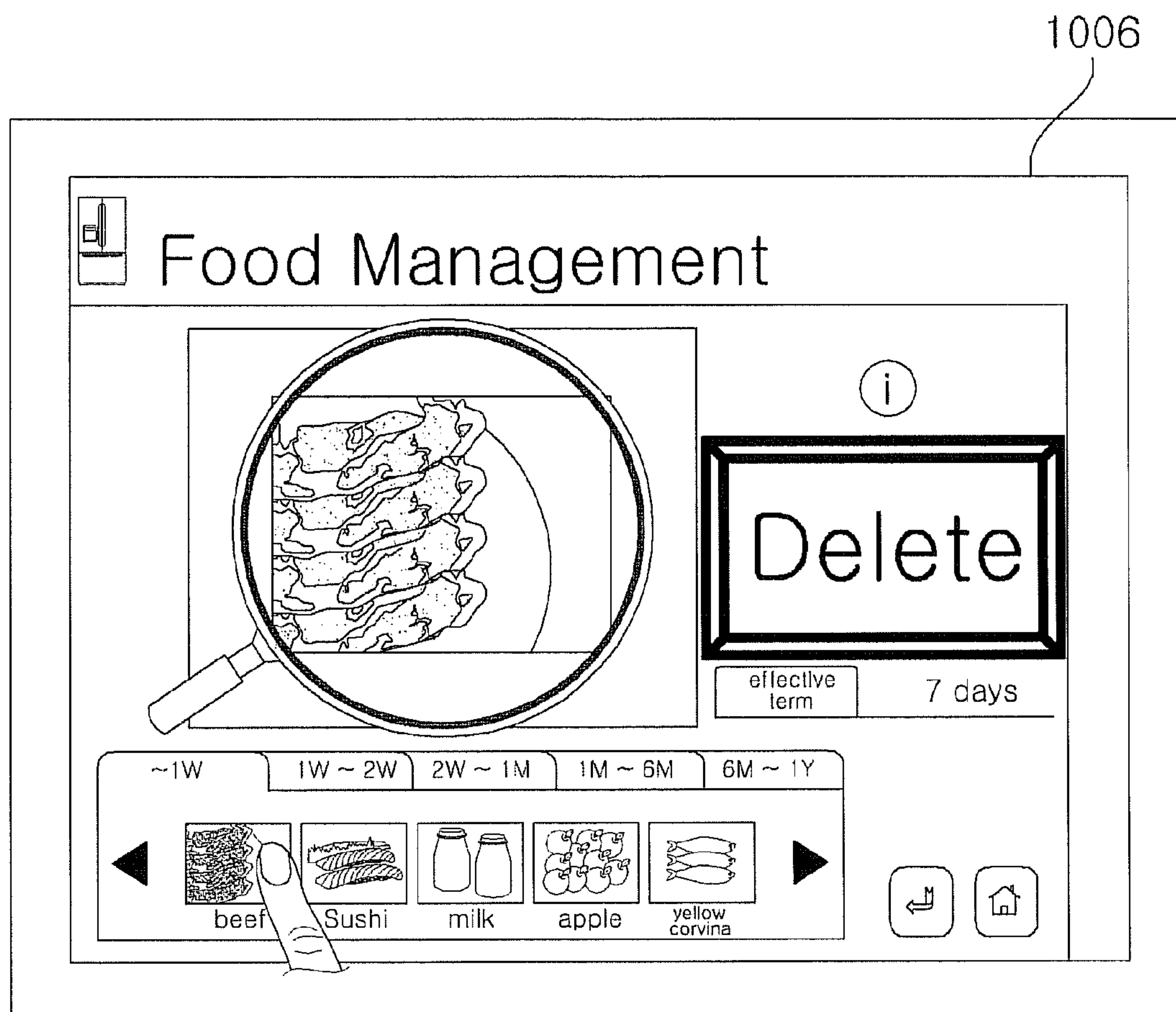


FIG. 11A

1012

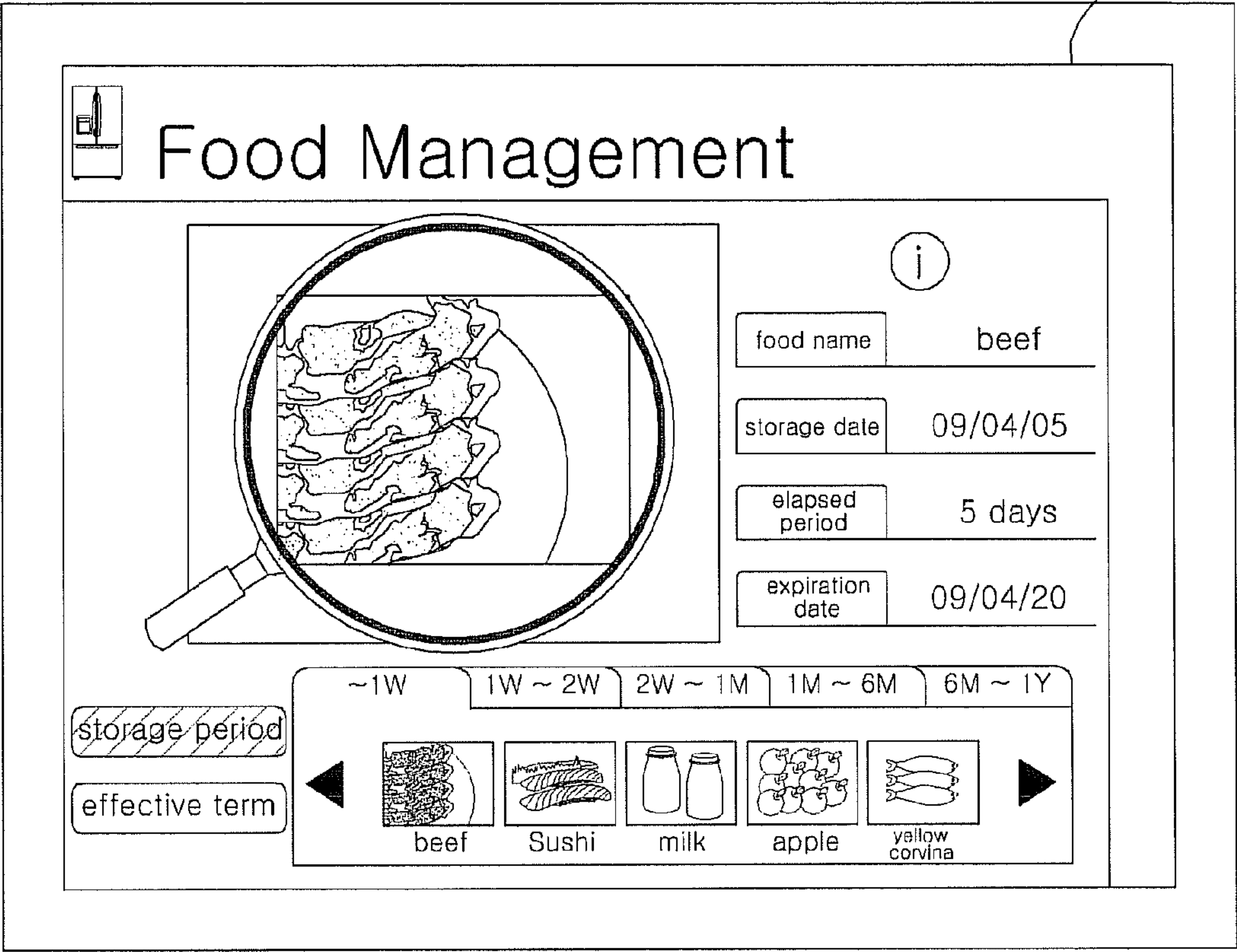


FIG. 11B

1014

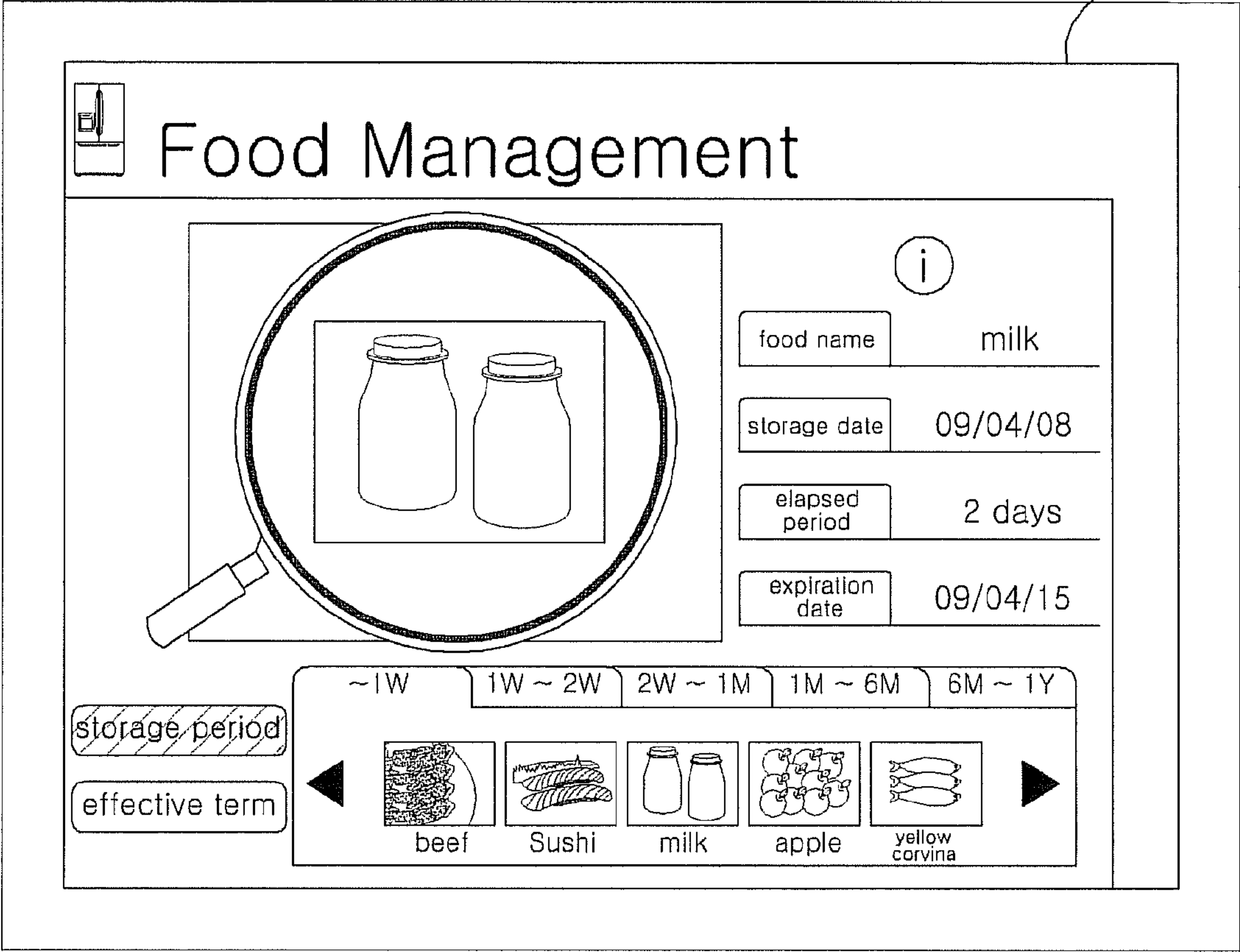


FIG. 11C

1016

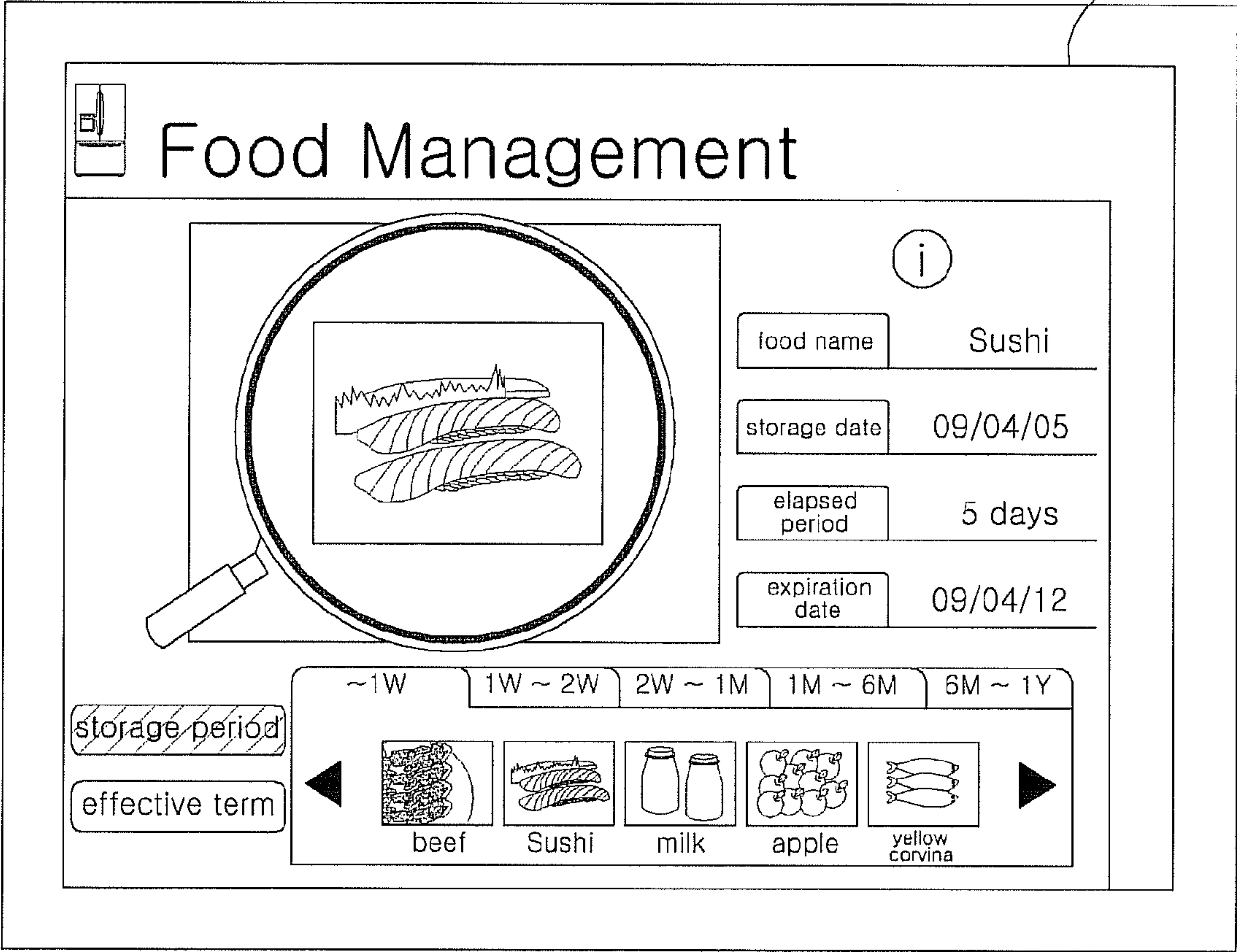


FIG. 11D

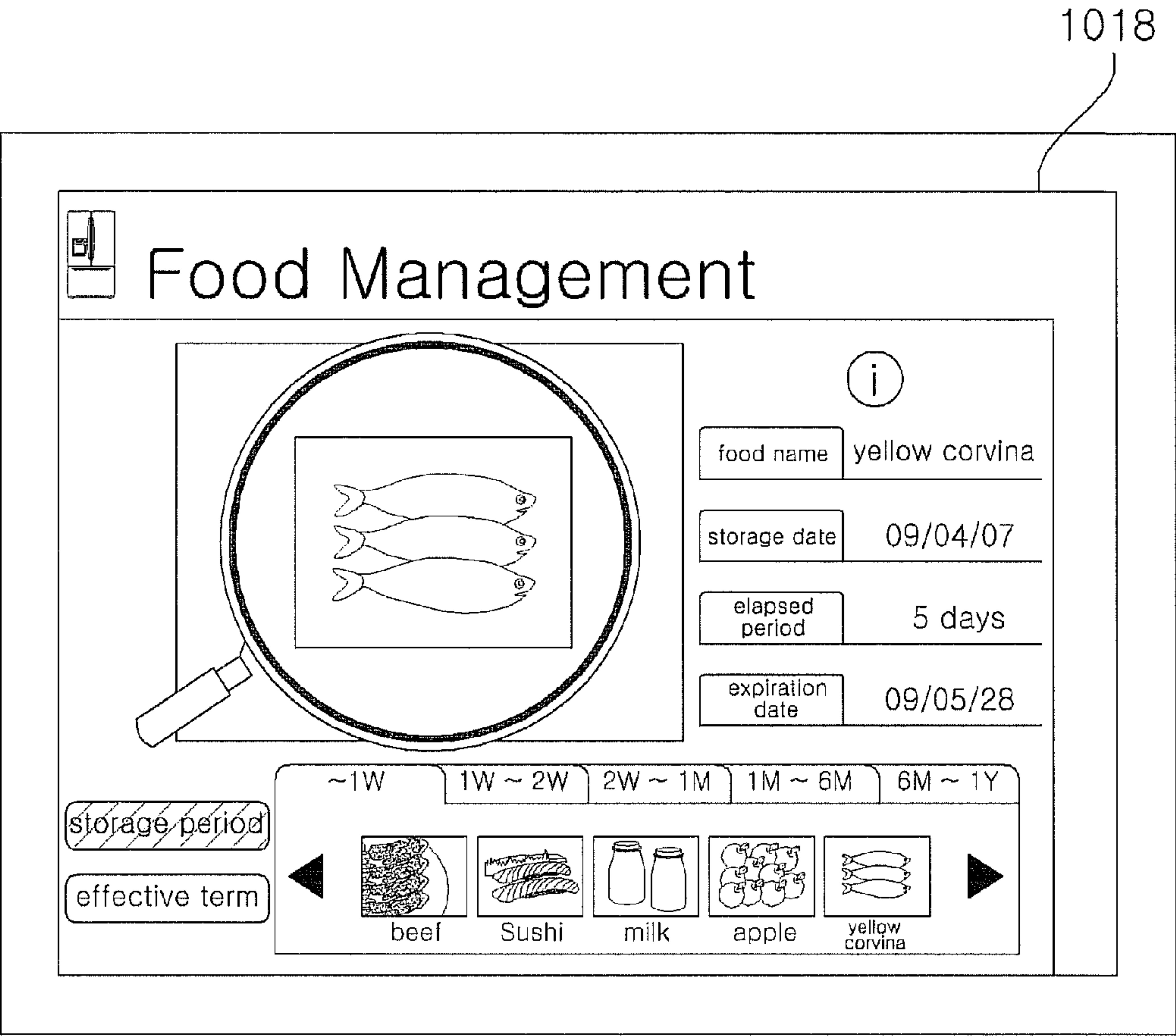


FIG. 11E

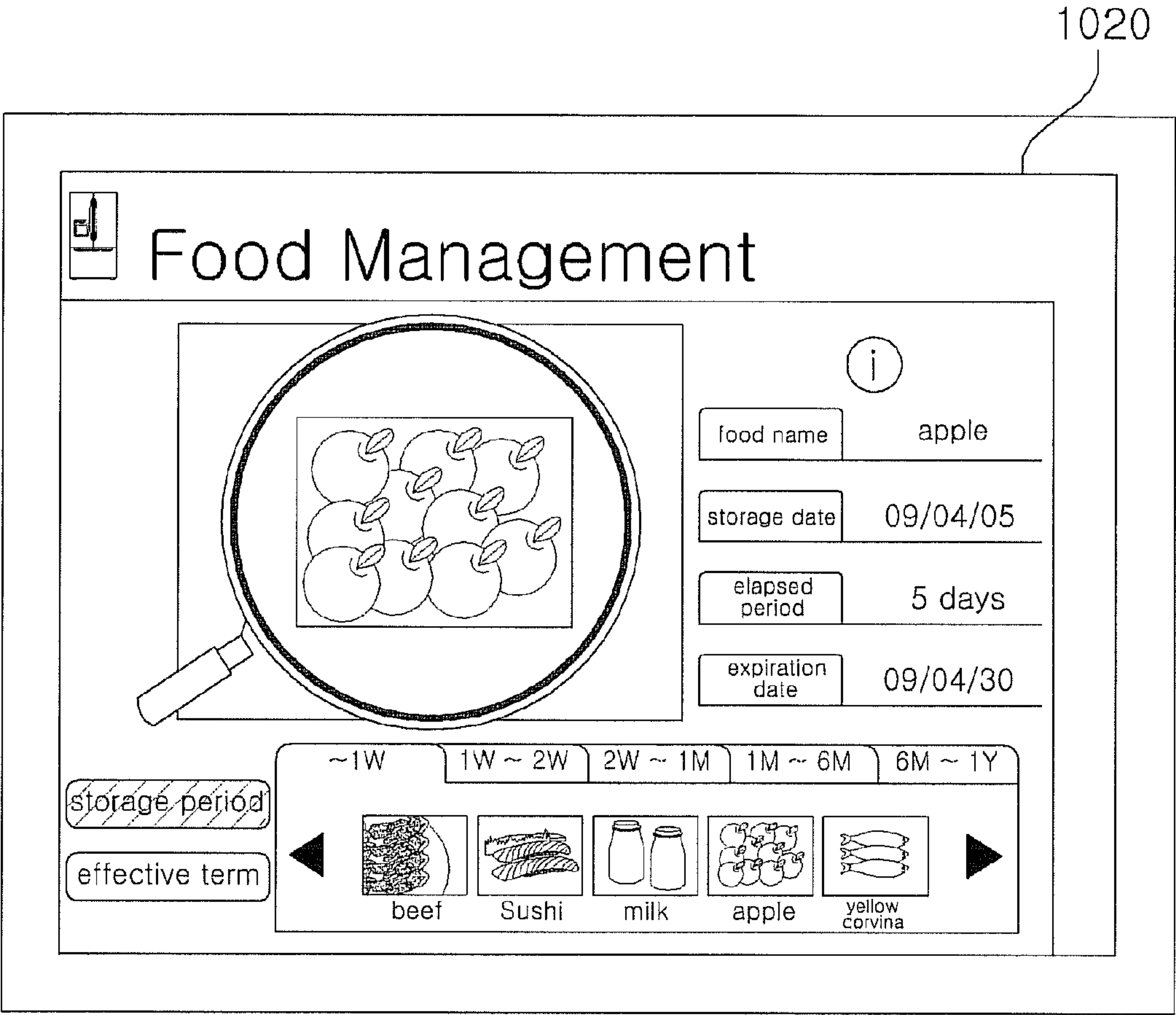


FIG. 11F

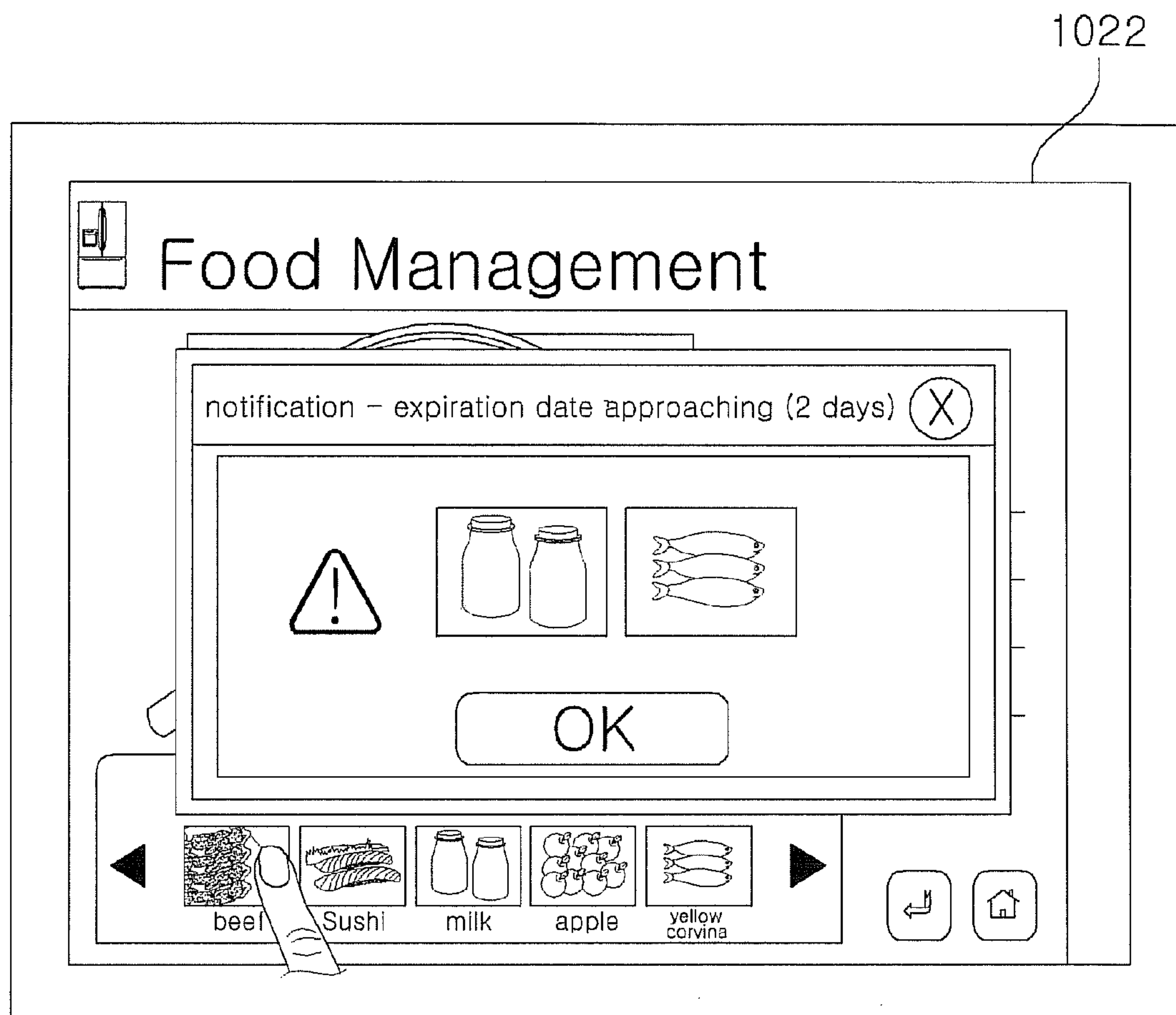


FIG. 11G

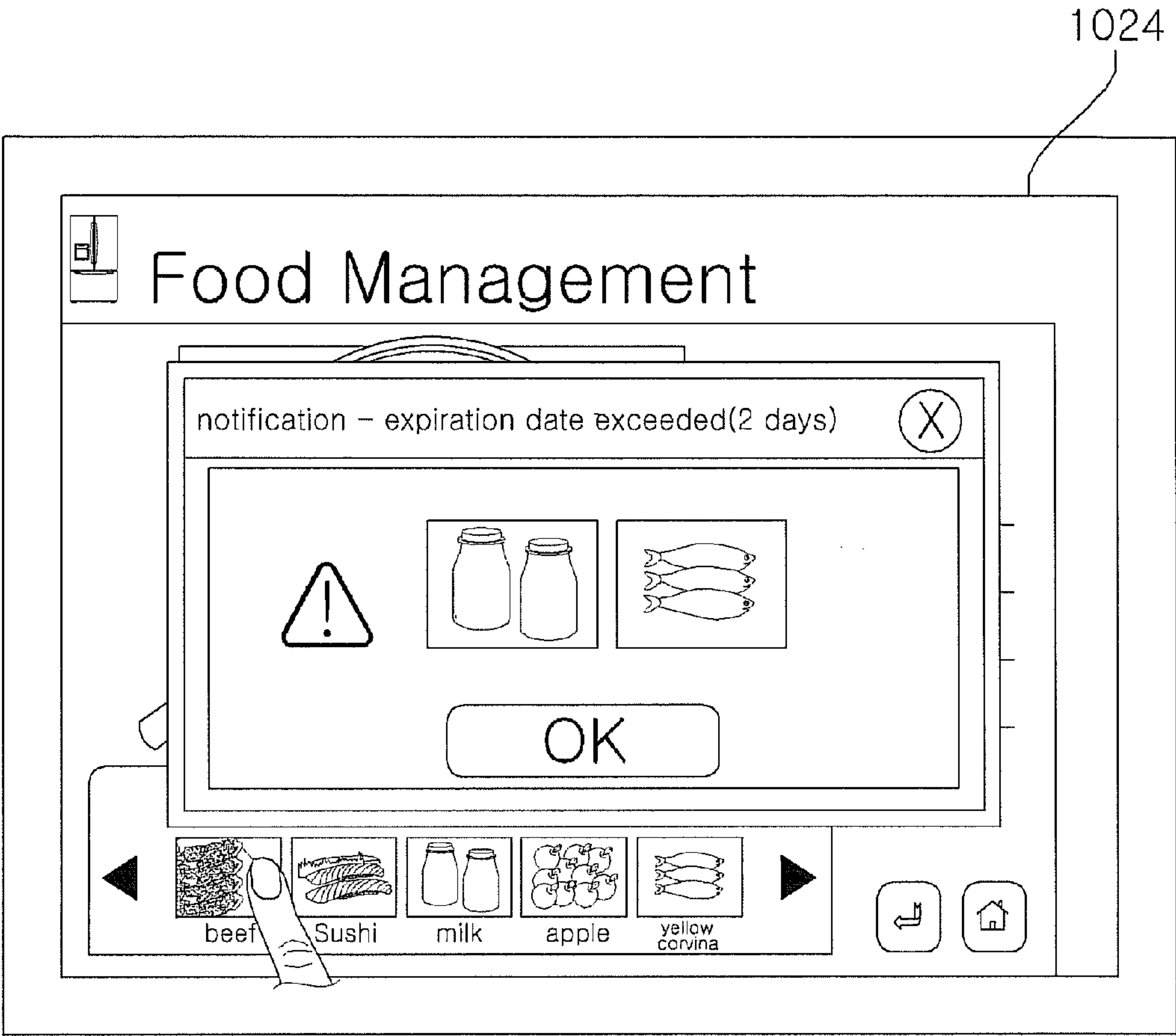


FIG. 12A

1030

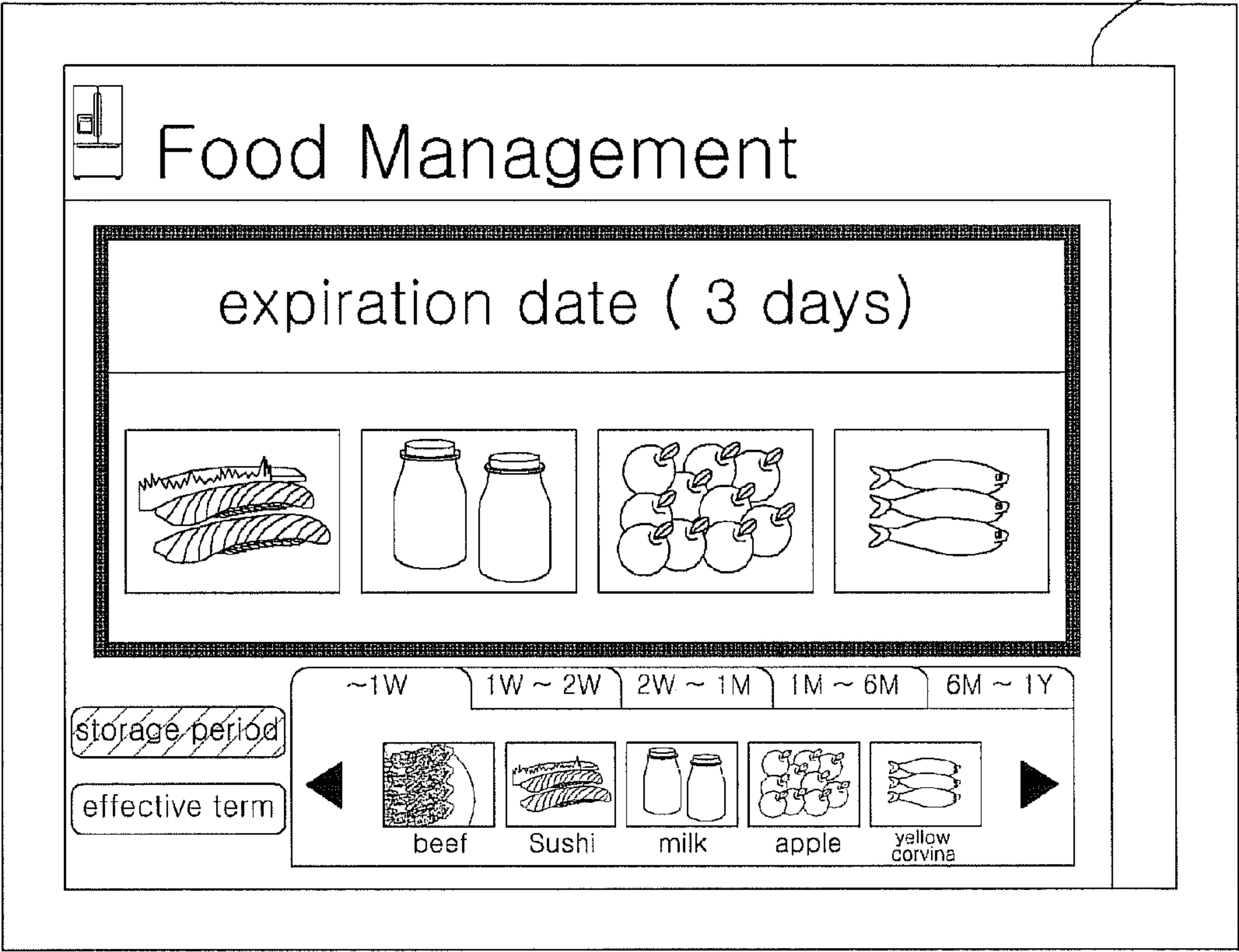


FIG. 12B

1032

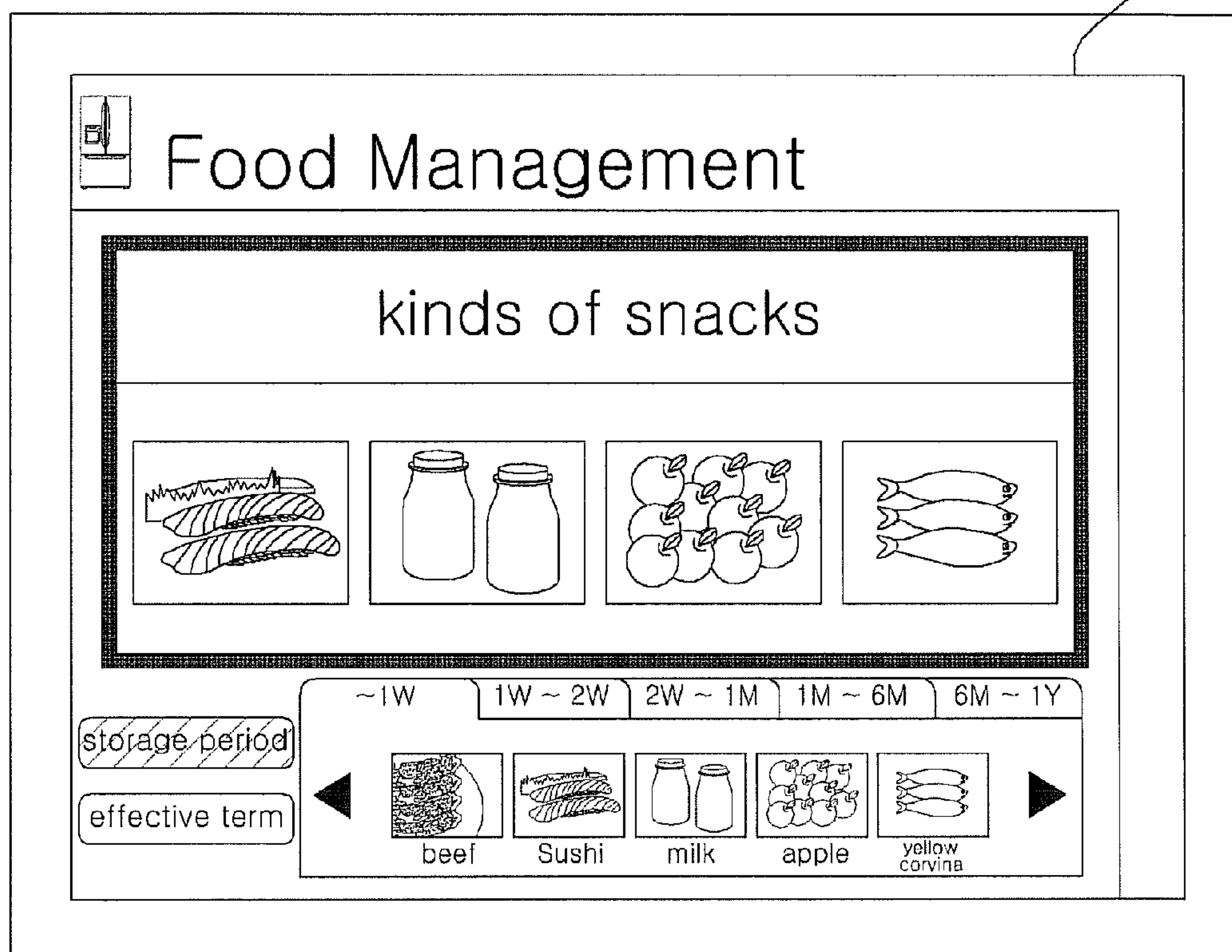


FIG. 13

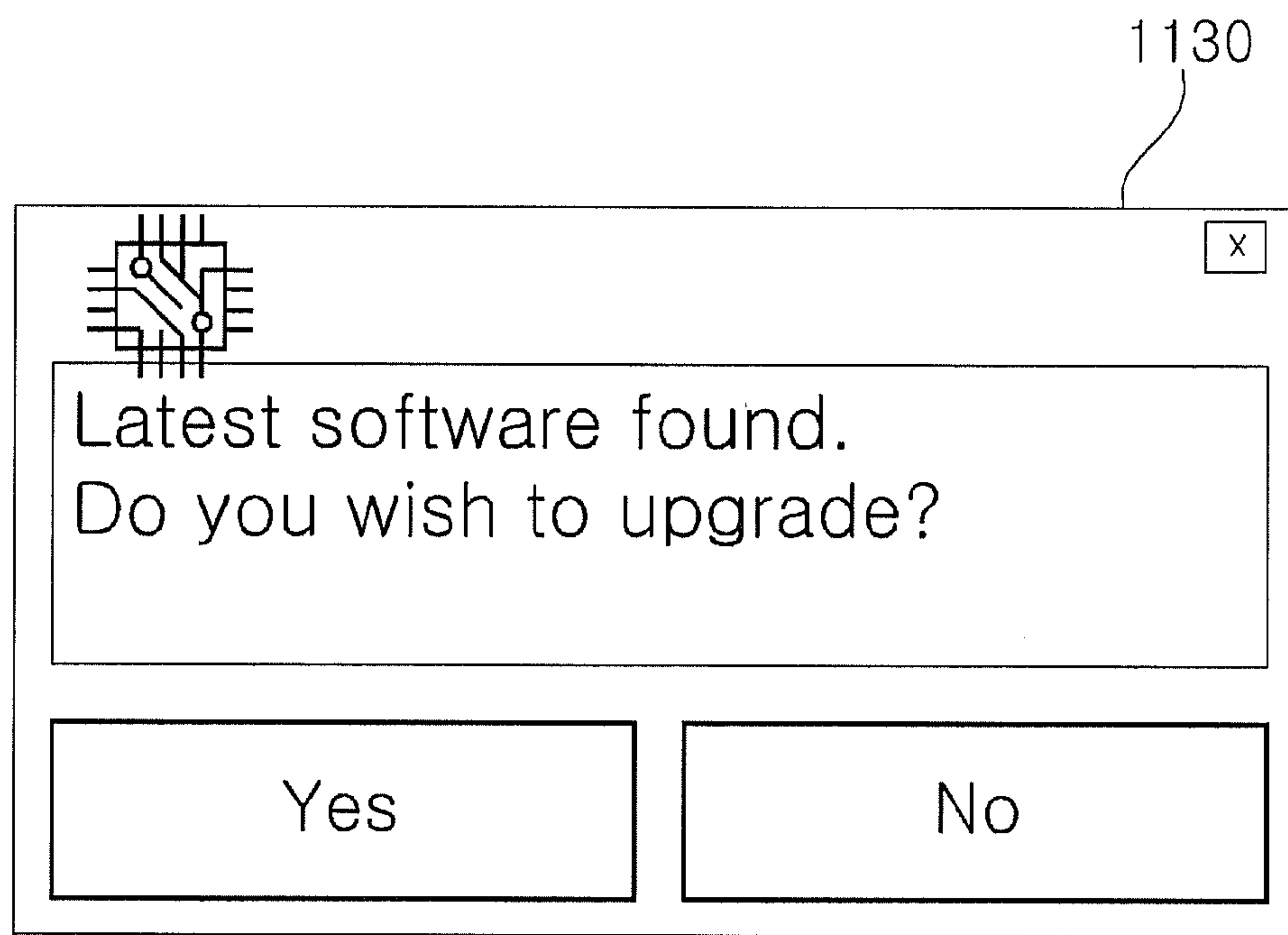


FIG. 14

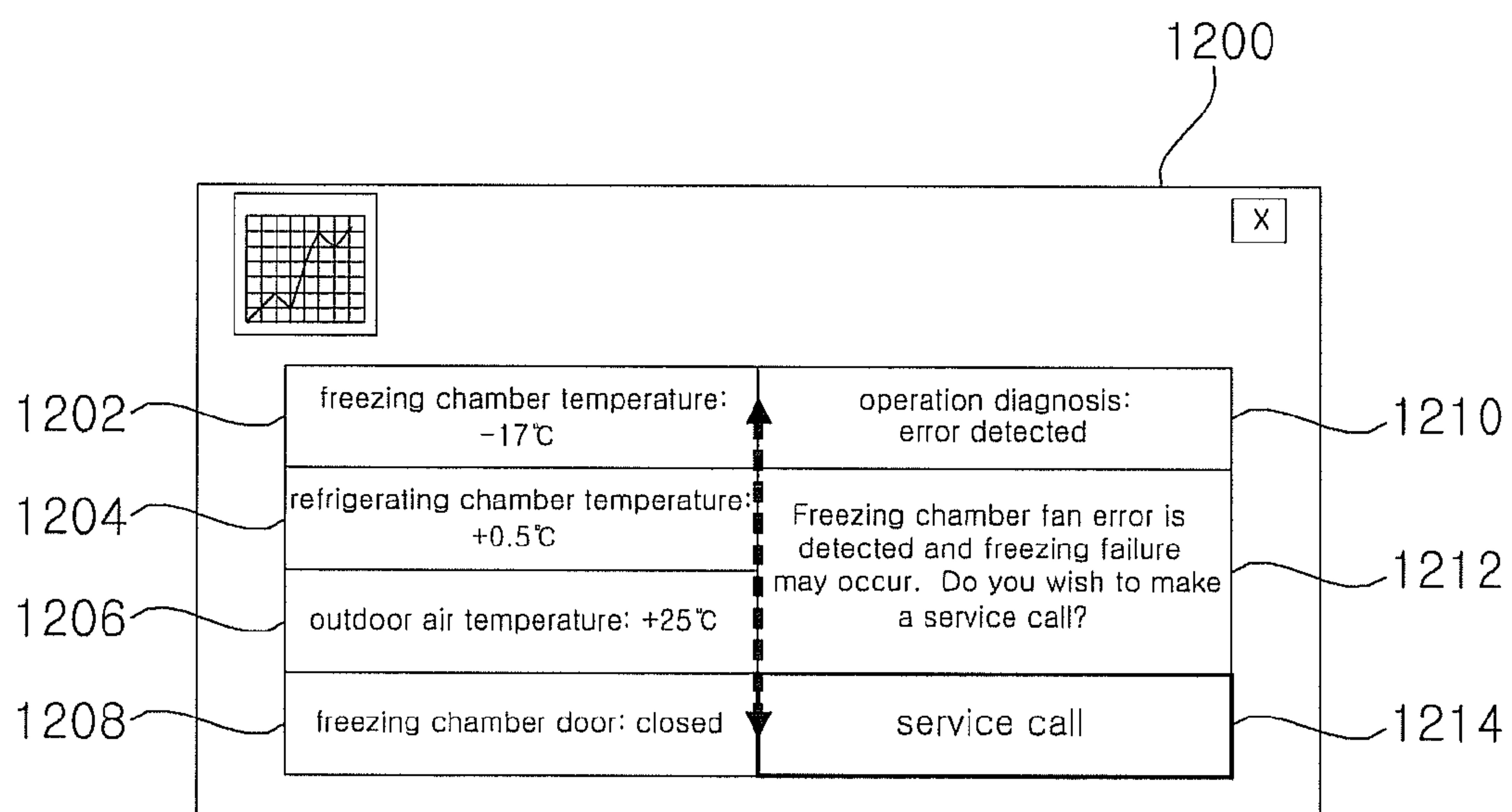


FIG. 15

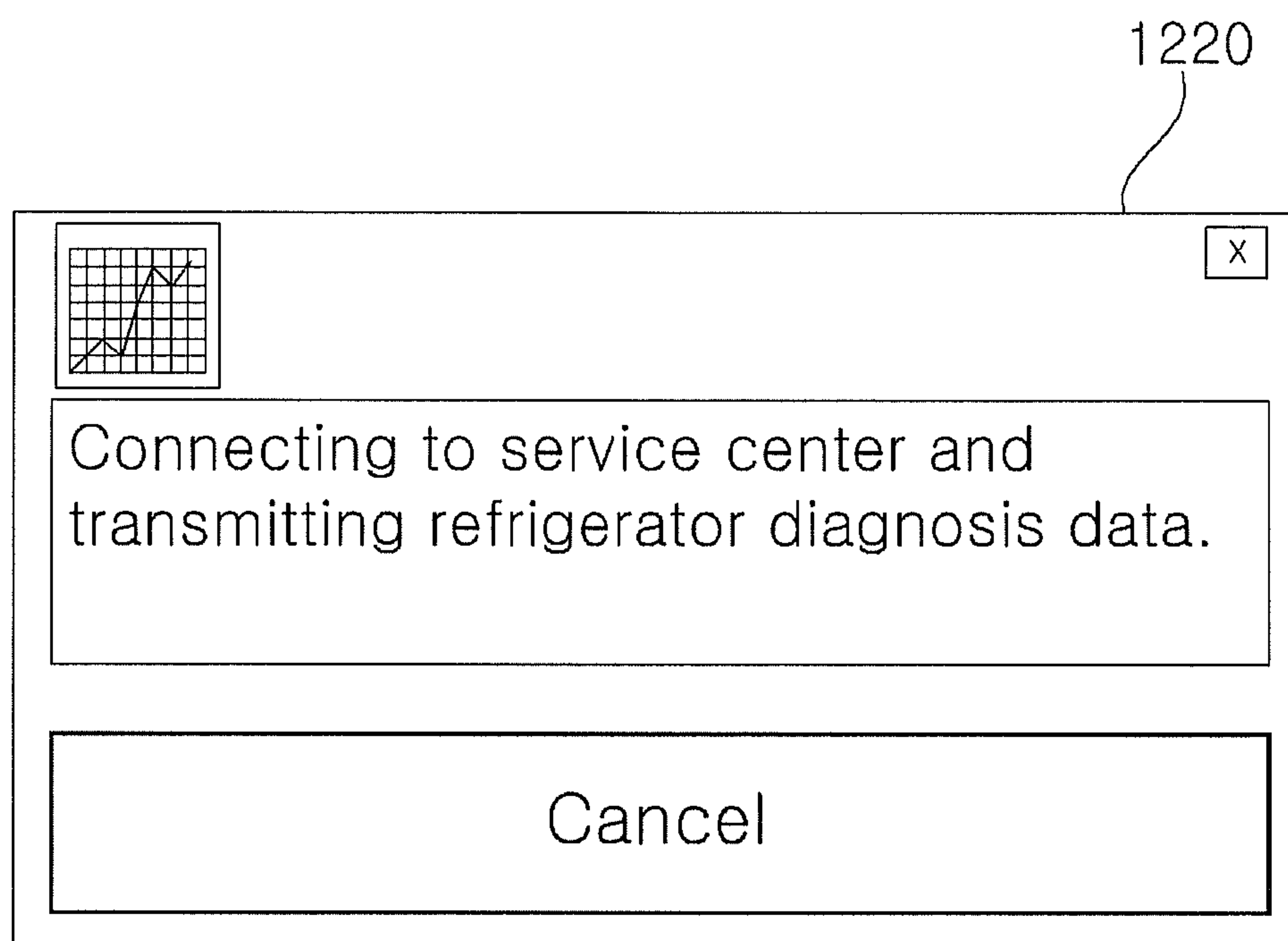


FIG. 16

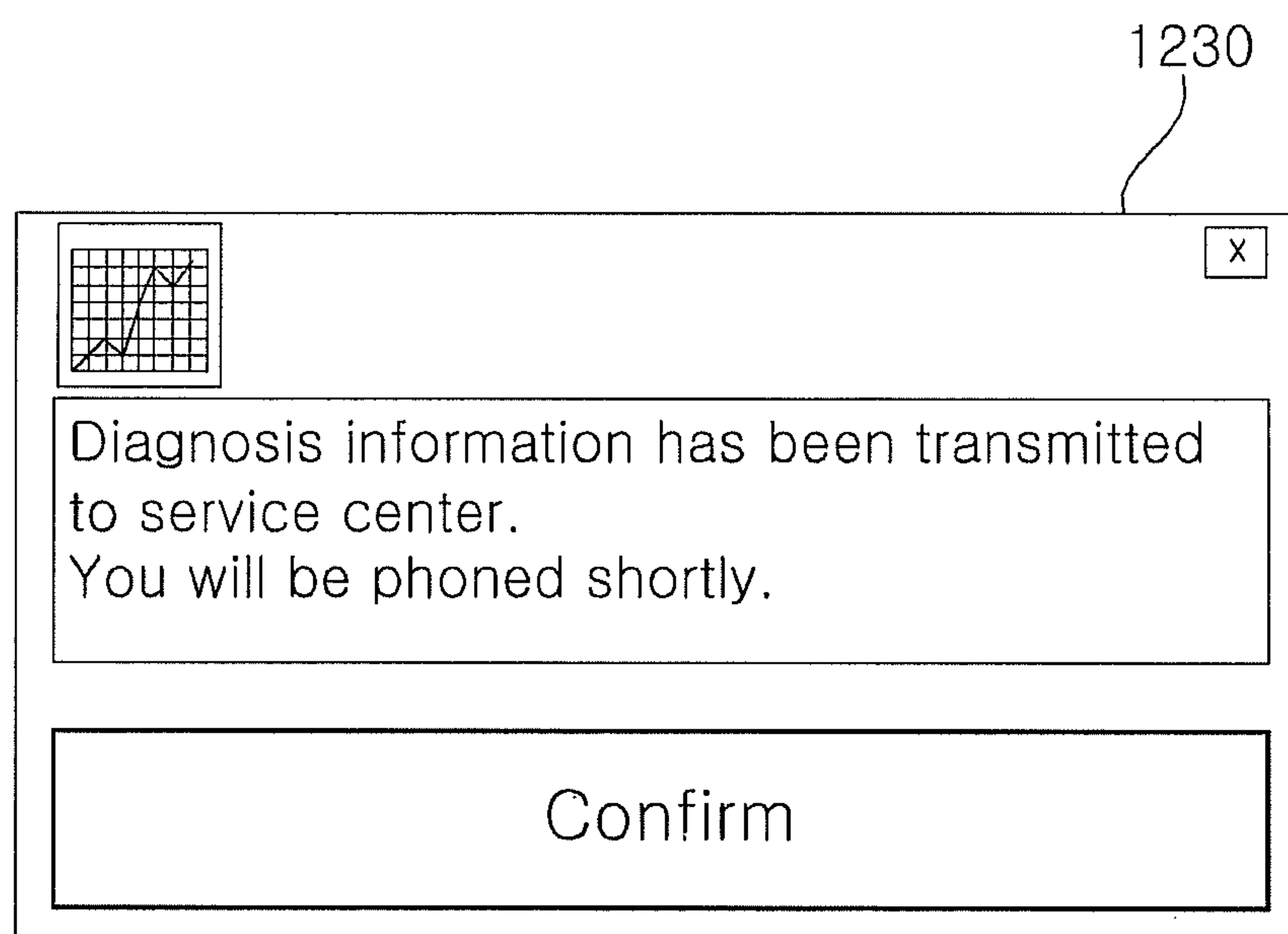


FIG. 17

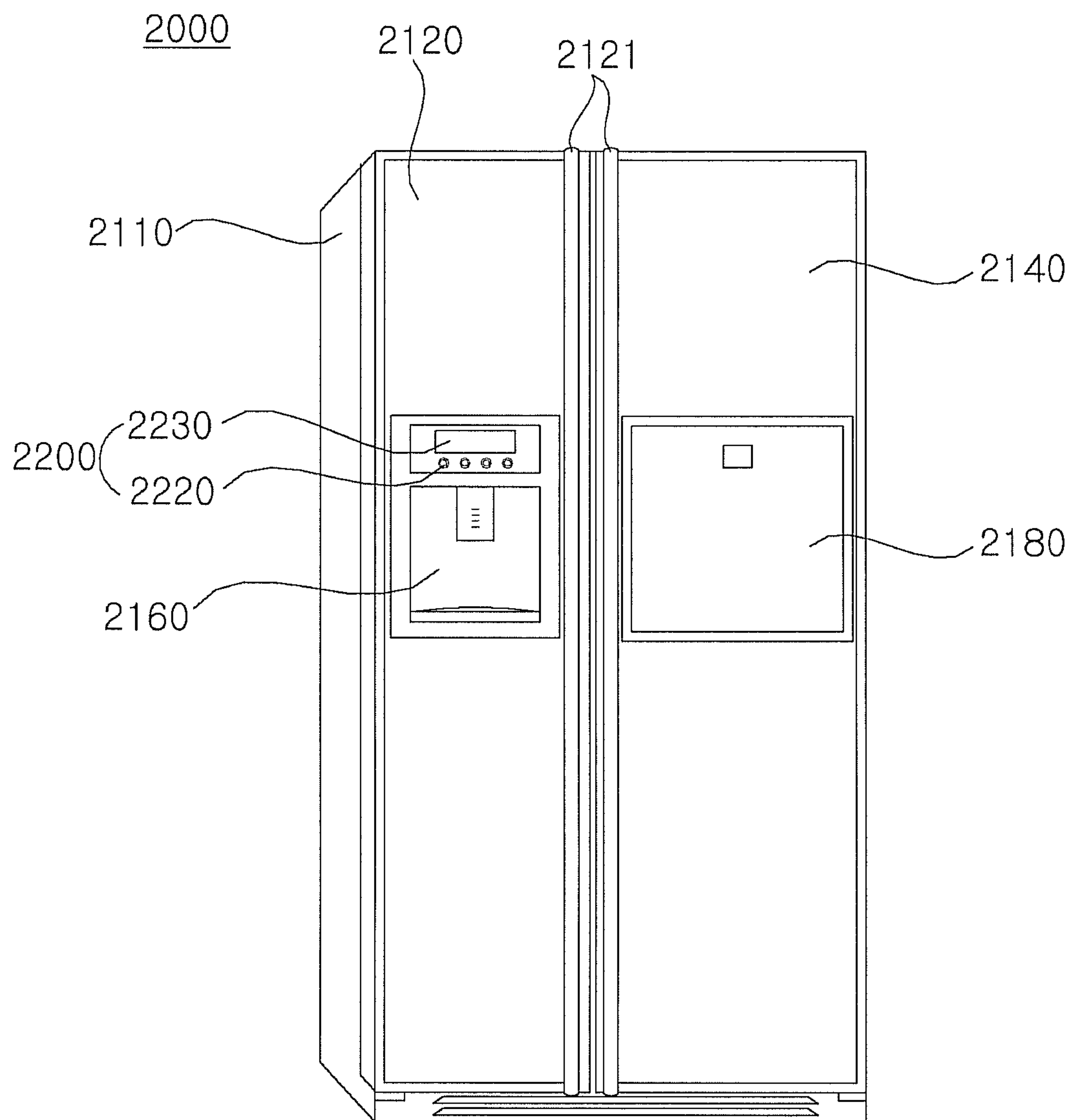
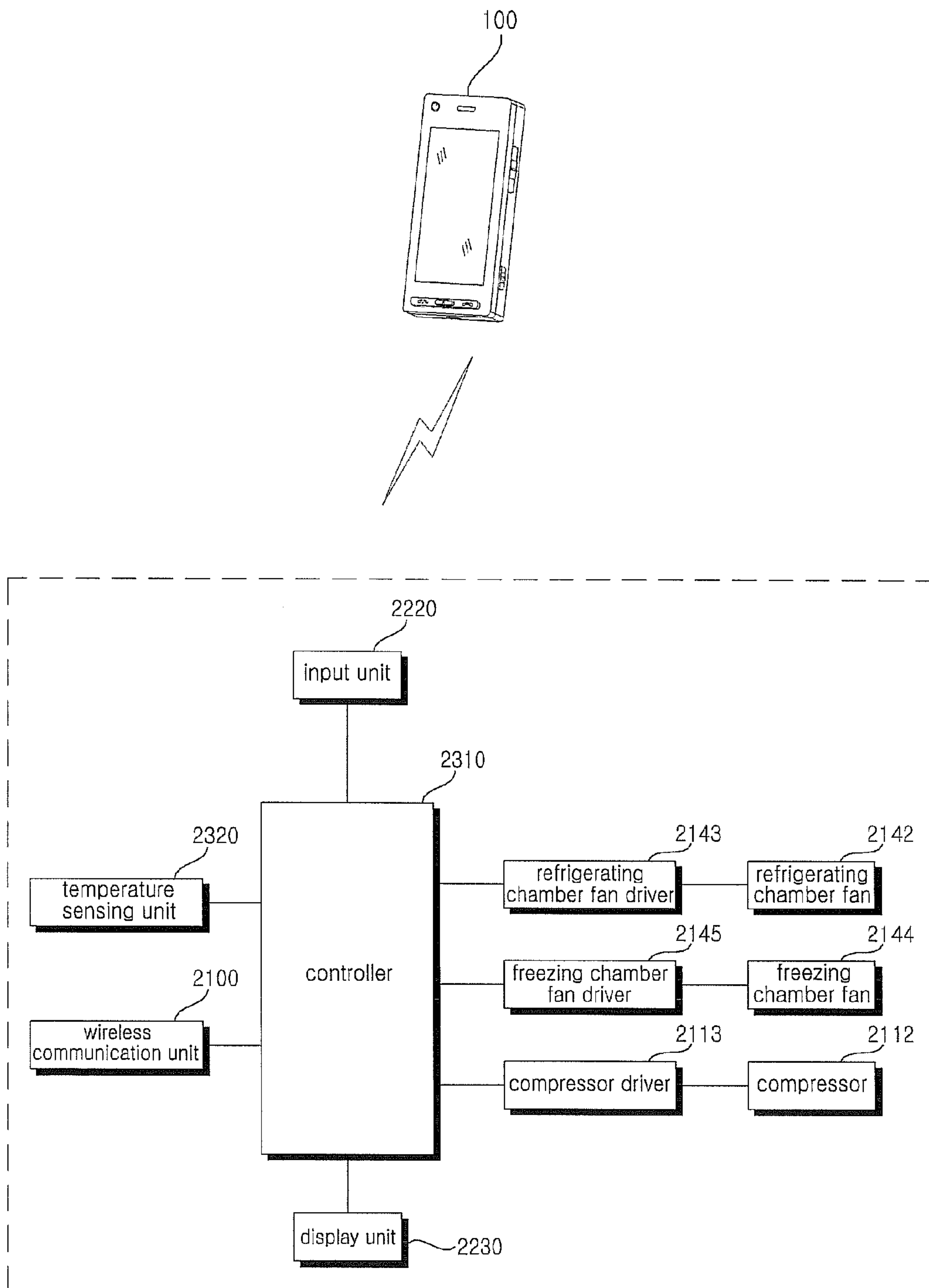


FIG. 18



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**MOBILE TERMINAL, OPERATING METHOD
THEREOF, AND REFRIGERATOR****CROSS-REFERENCE TO RELATED
APPLICATION**

This application is a Continuation of co-pending U.S. patent application Ser. No. 12/776,721, filed on May 10, 2010, which claims priority under 35 U.S.C. §119(a) from Korean Application No. 10-2009-0041006, filed on May 11, 2009, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION**1. Field of the Invention**

The present invention relates to a mobile terminal which is capable of readily controlling a refrigerator, an operating method thereof, and a refrigerator.

2. Description of the Related Art

Recently, home network technologies have been developed. A home network signifies a network in which a variety of home appliances are interconnected to enable the user to enjoy a convenient, safe and economical life service at any time inside and outside of a home. With the advance of digital signal processing technologies, refrigerators, washing machines, etc. have been gradually digitized, home appliance operating system technologies and high-speed multimedia communication technologies have been intensively deployed on digital home appliances, and a new type of information home appliance has appeared. Therefore, the home network has been developed still further.

A home network system constructed in a home includes a master device that is an electric appliance capable of controlling the operation of each home appliance or monitoring the state thereof, and one or more home appliances each having a function of responding to a request from the master device and a function of notifying information about a variation in the state thereof.

However, the construction of the above-mentioned home network system has the inconvenience of having to separately provide a separate master device which is capable of controlling the operation of each home appliance or monitoring the state thereof.

Moreover, in the case where a home appliance is a refrigerator, in order to know which foods there is a shortage of in the refrigerator at any place or time, there is a need to display state information of the refrigerator including kinds and freshness degrees of foods stored in the refrigerator using a mobile terminal.

SUMMARY OF THE INVENTION

Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a mobile terminal which is capable of readily controlling a refrigerator, an operating method thereof, and a refrigerator.

In accordance with an aspect of the present invention, the above and other objects can be accomplished by the provision of an operating method of a mobile terminal including receiving state information of a refrigerator from the refrigerator, displaying the state information of the refrigerator on a screen, and transmitting a control signal based on a control operation to the refrigerator.

In accordance with another aspect of the present invention, there is provided a mobile terminal for controlling a refrig-

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erator, the mobile terminal including a wireless communication unit for transmitting/receiving data to/from the refrigerator, a controller for generating information about foods stored in the refrigerator based on state information of the refrigerator received from the refrigerator, and a display unit for displaying a menu picture including a refrigerator management menu, and displaying the generated food information on a screen when a food management item in the refrigerator management menu is selected.

In accordance with a further aspect of the present invention, there is provided a refrigerator including a display unit for displaying an operating state of the refrigerator, a wireless communication unit for transmitting/receiving data to/from a mobile terminal, and a controller for controlling the wireless communication unit to transmit information about foods stored in the refrigerator to the mobile terminal.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a block diagram of a mobile terminal according to an exemplary embodiment of the present invention;

FIG. 2 is a front perspective view of a mobile terminal according to one embodiment of the present invention;

FIG. 3 is a rear perspective view of the mobile terminal shown in FIG. 2;

FIG. 4 is a flow chart illustrating a method for displaying information about foods stored in a refrigerator using a mobile terminal, according to one embodiment of the present invention;

FIG. 5 is a flow chart illustrating a method for monitoring a refrigerator using a mobile terminal, according to one embodiment of the present invention;

FIGS. 6 to 16 are screen diagrams illustrating exemplary embodiments of the present invention;

FIG. 17 is a perspective view showing the outer appearance of a refrigerator according to an exemplary embodiment of the present invention; and

FIG. 18 is a block diagram showing an internal configuration of the refrigerator of FIG. 17.

**DETAILED DESCRIPTION OF THE PREFERRED
EMBODIMENTS**

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts. It is to be noted that the suffixes of constituent elements used in the following description, such as "module" and "unit", are simply used by considering the ease of writing this specification, but do not have any particular importance or role. Accordingly, the terms "module" and "unit" can be used interchangeably.

FIG. 1 is a block diagram of a mobile terminal according to an exemplary embodiment of the present invention.

Referring to FIG. 1, a mobile terminal 100 according to the present invention may include a wireless communication unit 110, an audio/video (A/V) input unit 120, a manipulating unit 130, a sensing unit 140, an output unit 150, a storage unit 160, an interface unit 170, a controller 180, and a power supply 190. If necessary, when implemented in actual applications, two or more of these constituent elements may be combined

into one constituent element or one thereof may be subdivided into two or more constituent elements.

The wireless communication unit **110** may include a mobile communication module **111**, a wireless Internet module **113**, a short-range communication module **115**, and a global position system (GPS) module **117**. radio signals to/from at least one of a base station, an external terminal and a server over a mobile communication network. The radio signals may include a voice call signal, a video telephony call signal or various forms of data based on text/multimedia message transmission/reception.

The wireless Internet module **113** refers to a module for wireless Internet access. This module may be installed inside or outside of the mobile terminal **100**.

When a service call menu item is selected, the wireless Internet module **113** may make a connection to a service center and transmit refrigerator diagnosis data to the service center.

The short-range communication module **115** refers to a module for short-range communication. For example, short-range communication technologies may include Bluetooth, radio frequency identification (RFID), infrared data association (IrDA), ultra wideband (UWB), and ZigBee.

Also, the short-range communication module **115** may transmit/receive data to/from a refrigerator using, for example, Bluetooth. In detail, the short-range communication module **115** may receive state information of the refrigerator. The state information of the refrigerator may include at least one of food information, an expiration date of a food, a storage period of the food, a freezing chamber temperature, a refrigerating chamber temperature, an outdoor air temperature, door opening/closing information, operation diagnosis information, and an error content.

The global position system (GPS) module **117** receives location information from a plurality of GPS satellites.

The A/V input unit **120** is configured to input an audio signal or video signal. The A/V input unit **120** may include a camera module **121** and a microphone module **123**. The camera module **121** processes frames of a still image or moving image acquired by an image sensor in a video call mode or image capture mode. The processed image frames may be displayed on a display unit **151**.

The image frames processed by the camera module **121** may be stored in the storage unit **160** or externally transmitted via the wireless communication unit **110**. Two or more camera modules **121** may be provided depending on embodiments of the configuration of the terminal.

Also, if the user captures an image of a food to be stored in a refrigerator through the camera module **121**, the mobile terminal **100** may store the captured image in the storage unit **160**. Also, the mobile terminal **100** may set and store information about the food, for example, a storage date, an expiration date, etc.

The microphone module **123** receives an external sound signal through a microphone in a call mode, a recording mode, a voice recognition mode, or the like and processes the received sound signal to convert it into electrical audio data. In the call mode, the converted audio data may be converted into that of a format transmittable to a mobile communication base station through the mobile communication module **111** and then outputted to the mobile communication base station. Various noise removal algorithms may be employed in the microphone module **123** to remove noise generated in the course of receiving the external sound signal.

The manipulating unit **130** generates key input data that the user inputs to control the operation of the terminal. The manipulating unit **130** may include a key pad, a dome switch,

a touch pad (static pressure/capacitance), a jog wheel, a jog switch, and a finger mouse. In particular, the touch pad and the display unit **151** to be described later may constitute a layered structure, which may be called a touch screen.

The sensing unit **140** senses the current state of the mobile terminal **100**, such as the open/closed state of the mobile terminal **100**, the location of the mobile terminal **100** or the presence or absence of user contact with the mobile terminal **100**, and generates a sense signal for control of the operation of the mobile terminal **100** as a result of the sensing. For example, in the case where the mobile terminal **100** is a slide phone, the sensing unit **140** may sense whether the slide phone is open or closed. Also, the sensing unit **140** may perform a sensing function associated with whether the power supply **190** supplies power or whether the interface unit **170** is coupled with an external device.

The output unit **150** is provided to output an audio signal, a video signal or an alarm signal. To this end, the output unit **150** may include the display unit **151**, an audio output module **153**, and an alarm output module **155**.

The display unit **151** displays and outputs information processed in the mobile terminal **100**. For example, when the mobile terminal **100** is in the call mode, the display unit **151** may display a user interface (UI) or graphic user interface (GUI) associated with a call. When the mobile terminal **100** is in the video call mode or image capture mode, the display unit **151** may display captured or received images, respectively or simultaneously, and also displays a UI or GUI.

Also, the display unit **151** displays state information of a refrigerator on a screen. In detail, for the display of the state information of the refrigerator, the display unit **151** may display a menu picture including a refrigerator management menu having a plurality of items and, when any one of the refrigerator management menu items is selected, display a picture corresponding to the selected refrigerator management menu item.

For example, in the case where a food management item is selected, the display unit **151** may arrange and display a plurality of foods in the order of expiration dates or storage periods thereof. Also, the display unit **151** may arrange and display a plurality of foods according to kinds thereof. Also, the display unit **151**, when any one of foods stored in the refrigerator is selected, may display at least one of an image, name, current date, storage date, elapsed period, expiration date and barcode information of the selected food.

For example, the display unit **151** may display a list of periods in a first area and display images of one or more foods corresponding to a selected period in the period list in a second area. Also, in the case where any one of the images of the one or more foods displayed in the second area is selected, the display unit **151** may display the selected food image and information about a corresponding food. The food information may include one or more of a name, current date, storage date, elapsed period, expiration date and barcode information. On the other hand, the display unit **151** may display a list of food kinds in the first area and display images of one or more foods corresponding to a selected food kind in the food kind list in the second area.

On the other hand, in the case where a monitoring item is selected, the display unit **151** may display one or more of freezing chamber temperature information, refrigerating chamber temperature information, outdoor air temperature information, door opening/closing information, operation diagnosis information, error content information and a service call item. At this time, if the service call item is selected, the display unit **151** may display a service center connection state picture. Meanwhile, in the case where a software

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upgrade item is selected, the display unit **151** may display a software upgrade progress picture.

The audio output module **153** outputs audio data received from the wireless communication unit **110** or stored in the storage unit **160** in a call signal reception mode, a call mode, a recording mode, a voice recognition mode, a broadcast reception mode, or the like. The audio output module **153** also outputs sound signals related to particular functions performed by the mobile terminal **100**, for example, a call signal reception sound, a message reception sound, etc. This audio output module **153** may include a speaker and a buzzer.

The alarm output module **155** outputs a signal to notify the user of occurrence of an event in the mobile terminal **100**. The event occurring in the mobile terminal **100** may be, for example, call signal reception, message reception or key signal input. The alarm output module **155** may also output a signal in any form other than an audio signal or video signal to notify the user of occurrence of an event in the mobile terminal **100**. For example, the alarm output module **155** may output a signal in the form of a vibration. When a call signal is received or when a message is received, the alarm output module **155** may output a vibration to notify the user of such a situation. Alternatively, when a key signal is inputted, the alarm output module **155** may output a vibration as a feedback for the key signal input. This vibration output may enable the user to recognize occurrence of an event. Of course, the signal for event occurrence notification may also be outputted through the display unit **151** or audio output module **153**.

The storage unit **160** may store programs for processing and control of the controller **180** and may also function to temporarily store input/output data.

The storage unit **160** may include at least one type of storage media including a flash memory type, a hard disk type, a multimedia card micro type, a card type memory (for example, an SD or XD memory), a random access memory (RAM), and a read-only memory (ROM). The mobile terminal **100** may also manage a Web storage that performs the storage function of the storage unit **160** on the Internet.

The interface unit **170** acts as an interface between the mobile terminal **100** and all external devices connected to the mobile terminal **100**. The external devices connected to the mobile terminal **100** may include, for example, a wired/wireless headset, an external charger, a wired/wireless data port, a memory card socket, a SIM/UIM card socket, an audio input/output (I/O) terminal, a video I/O terminal, and an earphone. The interface unit **170** may receive data transmitted from the external devices and transfer the received data or power to each internal component of the mobile terminal **100** or transmit internal data of the mobile terminal **100** to the external devices.

The controller **180** typically controls the operation of each of the above-stated components of the mobile terminal **100**, so as to control the overall operation of the mobile terminal **100**. For example, the controller **180** may perform control and processing associated with a voice call, data communication, and a video call.

Also, the controller **180**, when any one item in a refrigerator management menu is selected, controls the display unit **151** to display a picture corresponding to the selected item. Here, the refrigerator management menu may include at least one of a food management item, a monitoring item, a software upgrade item and a remote control item.

For example, in the case where the food management item is selected, the controller **180** may control the display unit **151** to arrange and display a plurality of foods in the order of expiration dates or storage periods thereof. Also, the control-

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ler **180** may control the display unit **151** to arrange and display a plurality of foods according to kinds thereof. When any one of foods stored in a refrigerator is selected, the controller **180** may control the display unit **151** to display at least one of an image, name, current date, storage date, elapsed period, expiration date and barcode information of the selected food.

Also, the controller **180** may control the display unit **151** to display a list of periods in a first area of a refrigerator state picture, which displays information about the foods stored in the refrigerator, and display images of one or more foods corresponding to a selected period in the period list in a second area of the refrigerator state picture.

Also, in the case where any one of the images of the one or more foods displayed in the second area is selected, the controller **180** may control the display unit **151** to display the selected food image and information about a corresponding food. Here, the food information may include one or more of a name, current date, storage date, elapsed period, expiration date and barcode information.

Also, in the case where the monitoring item is selected, the controller **180** may control the display unit **151** to display one or more of freezing chamber temperature information, refrigerating chamber temperature information, outdoor air temperature information, door opening/closing information, operation diagnosis information, error content information and a service call item.

At this time, if the service call item is selected, the controller **180** may make a connection to a service center server and transmit refrigerator diagnosis data to the service center server. Also, in this case, the controller **180** may control the display unit **251** to display a service center connection state picture.

Also, in the case where the software upgrade item is selected, the controller **180** may control the display unit **151** to display a software upgrade progress picture. Also, the controller **180** may transmit and upload upgraded software to the refrigerator.

Also, in the case where the remote control item is selected, the controller **180** may transmit a refrigerator control signal inputted by the user to the refrigerator.

In this case, when the remote control item is selected, the controller **180** may display a refrigerator remote control picture through the display unit **151** and, when any one of refrigerator control items displayed in the remote control picture is selected, transmit a corresponding refrigerator control signal to the refrigerator.

The power supply **190**, under the control of the controller **180**, receives external power or internal power and supplies power necessary for the operation of each constituent element.

The constituent elements of the mobile terminal related to the present invention have been described in terms of the functionality of the mobile terminal. Hereinafter, the constituent elements of the mobile terminal related to the present invention will be described in detail in terms of the outer appearance of the mobile terminal with reference to FIGS. 2 and 3. For convenience of description, in the following description, it will be assumed that the mobile terminal is a mobile terminal of a bar type including a front touch screen, among mobile terminals of various types including a folder type, the bar type, a swing type and a slide type. However, it will be understood that the present invention is not limited to the bar type mobile terminal, but may be applied to mobile terminals of all types including the aforementioned types.

FIG. 2 is a front perspective view of a mobile terminal according to one embodiment of the present invention. Referring to FIG. 2, a case constituting the outer appearance of the

mobile terminal **100** is formed by a front case and a rear case. A variety of electronic components are built in a space defined by the front case and the rear case. At least one intermediate case may be additionally disposed between the front case and the rear case.

The display unit **151**, a first audio output module **153a**, a first camera module **121a**, and a first manipulating unit **130a** may be disposed in a body, more particularly the front case. A second manipulating unit **130b**, a third manipulating unit **130c**, and the microphone module **123** may be disposed on side surfaces of the rear case.

The display unit **151** may include a liquid crystal display (LCD), an organic light emitting diode (OLED) display, or the like to visually express information. A touch pad may be overlaid on the display unit **151** in a layered manner, so that the display unit **151** may operate as a touch screen to enable the input of information by the user's touch.

The first audio output module **153a** may be implemented in the form of a receiver or speaker. The first camera module **121a** may be implemented appropriately to capture an image of the user or the like or a moving image. The microphone module **123** may be implemented in an appropriate form to input the user's voice or other sounds.

The first to third manipulating units **130a**, **130b** and **130c** may be collectively referred to as a 'manipulating portion', which is the manipulating unit **130**, and may adopt any method as long as it has a tactile manner that allows the user to manipulate the manipulating units **130a**, **130b** and **130c** while receiving tactile feedback.

For example, the manipulating unit **130** may be implemented with a dome switch or touch pad that can input a command or information by the user's pushing or touching or implemented in a wheel or jog scheme in which a key is rotated or in a joystick scheme. In terms of functionality, the first manipulating unit **130a** may input commands such as START, END and SEND, and the second manipulating unit **130b** may input operation mode selection, etc. The third manipulating unit **130c** may operate as a hot-key to activate a special function in the mobile terminal **100**.

FIG. **3** is a rear perspective view of the mobile terminal shown in FIG. **2**. Referring to FIG. **3**, a fourth manipulating unit **130d**, a fifth manipulating unit **130e**, and the interface unit **170** may be disposed on a side surface of the rear case, and a second camera module **121b** may be additionally mounted on a rear surface of the rear case.

The second camera module **121b** may have an image capturing direction substantially opposite to that of the first camera module **121a** and a different number of pixels from that of the first camera module **121a**. For example, the first camera module **121a** may have a low pixel density not to be too extreme to capture an image of the user's face and transmit the captured image to another party, in the case of a video call or the like, and the second camera module **121b** may have a high pixel density in that an image of a general subject is sometimes not transmitted immediately after being captured.

A sixth manipulating unit **130f** may be installed around the second camera module **121b**. A jog wheel or the like capable of performing rotational input may be employed as the sixth manipulating unit **130f**.

A flash **125** and a mirror **126** may be additionally disposed adjacent to the second camera module **121b**. The flash **125** irradiates light to a subject when an image of the subject is captured by the second camera module **121b**. The mirror **126** enables the user to see his/her face, etc. reflected thereon when intending to capture an image of himself/herself using the second camera module **121b** (self-portrait).

A second audio output module (not shown) may be additionally disposed in the rear case. The second audio output module may implement a stereo function with the first audio output module **153a** and may be used for a call in a speaker-phone mode.

An antenna (not shown) for reception of broadcast signals may be further disposed at one side of the rear case in addition to an antenna for calls. The broadcast signal reception antenna may be installed to be extractable from the rear case.

The interface unit **170** acts as a passage for data exchange, etc. between the mobile terminal **100** and external devices connected to the mobile terminal **100**. For example, the interface unit **170** may include at least one of a connection terminal for wired/wireless connection to an earphone, a port for short-range communication, and a power supply terminal for supply of power to the mobile terminal **100**. Also, the interface unit **170** may include a card socket for receiving an external card, such as a subscriber identification module (SIM) card, a user identity module (UIM) card or a memory card for storage of information.

The power supply **190** is mounted in the rear case to supply power to the mobile terminal **100**. The power supply **190** may be, for example, a rechargeable battery, which may be detachably mounted in the rear case for charging, etc.

The mobile terminal described in this specification may include, for example, a mobile phone, a smart phone, a notebook computer, a digital broadcasting terminal, a personal digital assistant (PDA), a portable multimedia player (PMP), or the like.

FIG. **4** is a flow chart illustrating a method for displaying information about foods stored in a refrigerator using a mobile terminal, according to one embodiment of the present invention. Also, FIG. **6** illustrates a home appliance selection picture according to the present invention, FIG. **7** illustrates a menu picture according to the present invention, FIG. **8** illustrates a refrigerator state picture according to the present invention, and FIG. **9** illustrates a food management picture according to the present invention. Also, FIG. **10A** illustrates a food image capture picture according to the present invention, FIG. **10B** illustrates an effective term selection picture according to the present invention, and FIG. **10C** illustrates a food image delete picture according to the present invention. Also, FIG. **11A** illustrates a foods-by-storage periods picture according to one embodiment of the present invention, FIG. **11B** illustrates a foods-by-storage periods picture according to another embodiment of the present invention, and FIG. **11C** illustrates a foods-by-storage periods picture according to a further embodiment of the present invention. Also, FIG. **11D** illustrates a foods-by-effective terms picture according to one embodiment of the present invention, and FIG. **11E** illustrates a foods-by-effective terms picture according to another embodiment of the present invention. Also, FIG. **11F** illustrates an 'expiration date approaching' notification picture according to the present invention, and FIG. **11G** illustrates an 'expiration date exceeded' notification picture according to the present invention. Also, FIG. **12A** illustrates a shopping list picture according to the present invention, and FIG. **12B** illustrates a recommended snack list picture according to the present invention.

Referring to FIG. **4**, the mobile terminal according to the present invention may display a home appliance selection picture **600** including one or more home appliance areas **602**, **604**, **606** and **608** shown in FIG. **6**. At this time, if the user selects a specific home appliance (for example, a refrigerator) area, namely, the home appliance area **602**, the mobile terminal displays an initial menu picture **700** shown in FIG. **7** (S202). At this time, the initial menu picture **700** may include

a monitoring item **702**, a food management item **704**, a software upgrade item **706**, and an additional function item **708**. The additional function item may be a remote control item.

Also, the mobile terminal determines whether the food management item is selected (**S204**), and arranges information about foods stored in the refrigerator according to set periods if the food management item is selected (**S206**).

On the other hand, the mobile terminal may display a refrigerator state picture **800** including a first area **810** for displaying a list of periods, and a second area **820** for displaying one or more food images **822**, **824**, **826** and **828**, as shown in FIG. **8** (**S208**).

Also, the mobile terminal determines whether any one of the food images in the second area **820** is selected (**S210**), and, if any one of the food images is selected, displays the selected food image and information about a corresponding food by displaying a food management picture **900** including a food image area **902**, a stored food information display area **904**, a barcode recognition area **906**, and a delete button **908**, as shown in FIG. **9** (**S212**).

On the other hand, the mobile terminal may capture and store images of foods stored in the refrigerator through a food image capture picture **1002** shown in FIG. **10a**, select effective terms through an effective term selection picture **1004** shown in FIG. **10B**, and when he/she removes a food from the refrigerator, delete information about the food through a food image delete picture **1006** shown in FIG. **10C**.

Also, the mobile terminal may display, for example, a first foods-by-storage periods picture **1012** shown in FIG. **11A**, a second foods-by-storage periods picture **1014** shown in FIG. **11B**, and a third foods-by-storage periods picture **1016** shown in FIG. **11C**.

Also, the mobile terminal may display, for example, a first foods-by-effective terms picture **1018** shown in FIG. **11D**, and a second foods-by-effective terms picture **1020** shown in FIG. **11E**.

Also, the mobile terminal may display an 'expiration date approaching' notification picture **1022** shown in FIG. **11F**, and an 'expiration date exceeded' notification picture **1024** shown in FIG. **11G**. Also, the mobile terminal may display a shopping list picture **1030** shown in FIG. **12A**, and a recommended snack list picture **1032** shown in FIG. **12B**.

FIG. **13** illustrates a software upgrade picture according to the present invention.

Referring to FIG. **13**, when the software upgrade item is selected, the mobile terminal displays a software upgrade selection picture **1130** shown in FIG. **13**. At this time, if software upgrade is selected through the software upgrade selection picture **1130**, the mobile terminal displays a software upgrade progress picture (not shown). Thereafter, if the software upgrade is completed, the mobile terminal displays a software upgrade end picture (not shown).

FIG. **5** is a flow chart illustrating a method for monitoring a refrigerator using a mobile terminal, according to one embodiment of the present invention. Also, FIG. **14** illustrates a monitoring picture according to the present invention. FIG. **15** illustrates a service center connection state picture according to the present invention. FIG. **16** illustrates a diagnosis information transmission completion picture according to the present invention.

Referring to FIG. **5**, the mobile terminal displays the initial menu picture **700** shown in FIG. **7** (**S302**).

Also, the mobile terminal determines whether the monitoring item is selected (**S304**), and displays a monitoring picture **1200** as shown in FIG. **14** if the monitoring item is selected (**S306**). At this time, the monitoring picture **1200** may include freezing chamber temperature information

1202, refrigerating chamber temperature information **1204**, outdoor air temperature information **1206**, freezing chamber door opening/closing information **1208**, operation diagnosis information **1210**, error content information **1212** and a service call item **1214**.

Also, the mobile terminal determines whether the service call item is selected (**S308**), and, if the service call item is selected, makes a connection to a service center server and transmits refrigerator diagnosis data to the service center server (**S310**).

On the other hand, the mobile terminal displays a service center connection state picture **1220** as shown in FIG. **15** (**S312**). Thereafter, if the refrigerator diagnosis data transmission is completed, the mobile terminal may display a diagnosis information transmission completion picture **1230** as shown in FIG. **16**.

FIG. **17** is a perspective view showing the outer appearance of a refrigerator according to an exemplary embodiment of the present invention.

Referring to FIG. **17**, a refrigerator **2000** according to an exemplary embodiment of the present invention has an outer appearance schematically formed by a case **2110** having an internal space partitioned into a freezing chamber and a refrigerating chamber, a freezing chamber door **2120** for shielding the freezing chamber, and a refrigerating chamber door **2140** for shielding the refrigerating chamber.

Door handles **2121** are provided at front surfaces of the freezing chamber door **2120** and refrigerating chamber door **2140** in such a manner that they are forwardly protruded from the front surfaces. The user may readily grasp the door handles **2121** to pivot the freezing chamber door **2120** and refrigerating chamber door **2140**.

On the other hand, a home bar **2180**, for convenience, may further be provided at the front surface of the refrigerating chamber door **2140** to enable the user to remove a food stored in the refrigerating chamber, such as a beverage, without opening the refrigerating chamber door **2140**.

A dispenser **2160**, for convenience, may further be provided at the front surface of the freezing chamber door **2120** to enable the user to easily take out ice or water without opening the freezing chamber door **2120**. A control panel **2200** may be provided at an upper side of the dispenser **2160** to control a driving operation of the refrigerator **2000** and display the state of the refrigerator **2000** in operation on a screen.

The control panel **2200** may include an input unit **2220** consisting of a plurality of buttons, and a display unit **2230** for displaying a control picture, an operating state, etc.

The display unit **2230** displays a control picture, an operating state, and information such as an internal temperature of the refrigerator. For example, the display unit **2230** may display a service type (cubed ice, water, crushed ice or the like) of the dispenser, a set temperature of the freezing chamber, and a set temperature of the refrigerating chamber.

This display unit **2230** may be implemented in various forms including a liquid crystal display (LCD), a light emitting diode (LED) display, and an organic light emitting diode (OLED) display. Also, the display unit **2230** may be implemented in the form of a touch screen that can also perform the function of the input unit **2220**.

The input unit **2220** may include a plurality of manipulating buttons. For example, the input unit **2220** may include a dispenser setting button (not shown) for setting a service type (cubed ice, water, crushed ice or the like) of the dispenser, a freezing chamber temperature setting button (not shown) for setting the temperature of the freezing chamber, and a refrigerating chamber temperature setting button (not shown) for setting the temperature of the refrigerating chamber.

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erating chamber temperature setting button (not shown) for setting the temperature of the refrigerating chamber.

Here, it will be understood that the refrigerator according to the present embodiment is not limited to a double door type shown in FIG. 17, but may be applied to any type including a one door type, a sliding door type, and a curtain door type.

FIG. 18 is a block diagram showing an internal configuration of the refrigerator of FIG. 17.

Referring to FIG. 18, the refrigerator further includes, internally, a wireless communication unit **2100**, a controller **2310**, a temperature sensing unit **2320**, a compressor **2112**, a compressor driver **2113**, a refrigerating chamber fan **2142**, a refrigerating chamber fan driver **2143**, a freezing chamber fan **2144**, and a freezing chamber fan driver **2145**.

The compressor **2112**, compressor driver **2113**, refrigerating chamber fan **2142**, refrigerating chamber fan driver **2143**, freezing chamber fan **2144**, freezing chamber fan driver **2145** and temperature sensing unit **2320** generally operate for air conditioning within the refrigerating chamber or freezing chamber of the refrigerator, as well known in the art, and a description thereof will thus be omitted.

The wireless communication unit **2100** transmits/receives data to/from the mobile terminal **100**.

The wireless communication unit **2100** transmits state information of the refrigerator, more particularly information about kinds, expiration dates and storage periods of foods stored in the refrigerator. Also, the wireless communication unit **2100** may transmit freezing chamber temperature information, refrigerating chamber temperature information, outdoor air temperature information, door opening/closing information, operation diagnosis information, error content information, etc.

Also, the wireless communication unit **2100** receives a refrigerator control signal from the mobile terminal **100**. The refrigerator control signal may be, for example, a control signal for setting of a refrigerating chamber temperature, a freezing chamber temperature or the like, which may correspond to the above-stated remote control item of the mobile terminal **100**. Also, the wireless communication unit **2100** may receive refrigerator management software from the mobile terminal **100**.

The controller **2310** controls the operation of the wireless communication unit **2100**. For example, the controller **2310** may control transmission of state information of the refrigerator including food related information, freezing chamber temperature information and refrigerating chamber temperature information. Also, the controller **2310** may perform a control operation corresponding to a received refrigerator control signal. Meanwhile, in the case where refrigerator management software is received, the controller **2310** may perform upgrade based on the received refrigerator management software.

In this manner, it is possible to simply and conveniently control the refrigerator using the mobile terminal **100**.

On the other hand, the refrigerator may further include a camera unit (not shown) for acquiring images of foods stored in the refrigerator. The acquired images may be transmitted to the mobile terminal **100** through the wireless communication unit **2100** together with corresponding food information.

As is apparent from the above description, according to the present invention, it is possible to readily determine the state of a refrigerator using a mobile terminal. Also, it is possible to simply control the refrigerator using the mobile terminal.

In detail, in order to know which foods there is a shortage of in the refrigerator at any place or time, it is possible to

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display information about foods stored in the refrigerator including kinds and freshness degrees of the stored foods using the mobile terminal.

Moreover, in the case where an error occurs in the refrigerator, the mobile terminal may make a connection to a service center server in real time to transmit refrigerator diagnosis data to the service center server, and display a service center connection state picture.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

What is claimed is:

1. A refrigerator comprising:

a case having an internal space partitioned into a freezing chamber and a refrigerating chamber;
a freezing chamber door and a refrigerating chamber door;
a compressor;
a compressor driver to drive the compressor; and
a first wireless communication unit to exchange data with a mobile terminal,

wherein the mobile terminal includes

a second wireless communication unit configured to receive state information of a refrigerator and to transmit a control signal based on a control operation to the refrigerator when a remote control item in a refrigerator management menu is selected,

a display configured to display the state information of the refrigerator, and

a controller configured to control the display to display information associated with food stored in the refrigerator on the screen when a food management item in the refrigerator management menu is selected, and

wherein when the food information is displayed, the display displays a list of time periods on a first area of the display and displays one or more food images on a second area of the display.

2. The refrigerator according to claim 1, wherein the first wireless communication unit transmits the state information to the mobile terminal and receives the control signal from the mobile terminal.

3. The refrigerator according to claim 2, wherein the state information includes information about kinds, expiration dates and storage periods of foods stored in the refrigerator.

4. The refrigerator according to claim 2, wherein the first wireless communication unit of the refrigerator further transmits at least one of freezing chamber temperature information, refrigerating chamber temperature information, outdoor air temperature information, door opening/closing information, operation diagnosis information, or error content information.

5. The refrigerator according to claim 1, wherein the mobile terminal includes a camera configured to acquire images of the foods stored in the refrigerator, wherein the controller generates the food information using the acquired food images.

6. The refrigerator according to claim 1, wherein the controller controls the display to display the refrigerator management menu, the refrigerator management menu including at least one of the food management item, a monitoring item, a software upgrade item, or the remote control item.

7. The refrigerator according to claim 1, wherein when a time period item in the list of periods is selected, the display displays the selected food image and food information associated with the selected food image, wherein the food infor-

mation includes one or more of a name, current date, storage date, elapsed period, expiration date, or barcode information.

8. The refrigerator according to claim 1, wherein, when any one of the food images in the second area is selected, the controller controls the display to display the selected food image, food information concerning the selected food image, and a delete button, and wherein, when the delete button is selected, the controller deletes the food information concerning the selected food image.

9. The refrigerator according to claim 1, wherein the controller arranges a plurality of foods in order according to expiration date or storage period,

the display displays the list of time periods on the first area and displays one or more food images arranged corresponding to a prescribed time period in the second area.

10. The refrigerator according to claim 1, wherein the mobile terminal includes an audio output module configured to output an audio signal processed by the mobile terminal, wherein the second wireless communication unit of the mobile terminal including a GPS module that receives location information, and a mobile communication module that transmits and receives voice call signals.

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